Saskatchewan
Ministry of
Agriculture

FINAL REPORT

RESEARCH

ADF

AGRICULTURE DEVELOPMENT FUND

20060056

IRRIGATION WATER QUALITY AND FOOD SAFETY

Funded by: The Agriculture Development Fund

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Irrigation Water Quality and Food Safety

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March 1, 2010

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Final REPORT

Agriculture Development Fund Project # 20060056

Project Title: Irrigation Water Quality and Food Safety

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Summary

Contamination of surface waters with nutrients, bacteria and pesticides can increase with greater agricultural intensity. This can cause a wide array of human health problems and can adversely affect the safety of water for drinking, fisheries, industry, irrigation, livestock watering and recreation. Therefore, monitoring surface water quality is essential to ensure long-term, healthy and sustainable agricultural water supplies for food production, protection of the aquatic environment, and water supply expansion.

The objective of this project was to measure irrigation water quality parameters that could potentially impact the food safety of irrigated crops. Irrigation water quality was monitored at 14 locations within four areas of Saskatchewan: (1) Lake Diefenbaker Development Area (LDDA), (2) Saskatoon South East Water Suppy (SSEWS) system, (3) Moon Lake Irrigation District (down stream from LDDA and upstream from Saskatoon) and (4) the Qu'Appelle River in the Lumsden Valley (upstream and downstream from the junction of Wascana Creek and the Qu'Appelle River). Samples were collected three times during the growing season coinciding with peak irrigation water demand over the three year period 2007-2009. Water samples were collected using a grab sample technique. As well, at the five locations in the SSRID No.1 of the LDDA, weekly integrated/composite samples were collected with automatic water samplers as a comparison with the grab sample technique.

The irrigation water quality analyses indicated that the water sampled in the four areas of Saskatchewan was generally of good quality for use on most soil types according to current irrigation water-soil compatibility guidelines utilized in Saskatchewan. Water samples from the Moon Lake Irrigation District, SSEWS and Qu'Appelle River in the Lumsden area had slightly elevated salt and SAR levels compared to the water in Lake Diefenbaker indicating a slight degradation in water quality the further it moved through the water delivery system. Some water samples had total dissolved solids that exceeded the Irrigation Guideline for sensitive crops which could result in a slight decrease in production for these salt sensitive crops.

Nutrient levels in the water samples collected were generally low. Total nitrogen was detected in 100% of the samples, ammonia in 26% of the samples, nitrate-N in 11% of the samples, nitrite-N in 4% of the samples, total P in 14% of the samples and inorganic P in 22% of the samples.

Total and fecal coliform bacteria were detected in 86% and 75% respectively of the samples collected. There was a wide range in the measured quantity of coliform bacteria however, only 4 samples (2%) exceeded the Irrigation Guideline of 1000 MPN/100 ml for total coliforms and 11 samples (6%) exceeded the Irrigation Guideline of 100 MPN/100 ml for fecal coliforms. Incidences where total and fecal coliform bacteria exceed the Irrigation Guideline could cause concern for use on crops such as vegetables that are consummed raw. There were no observed seasonal trends in total or fecal coliform levels in the irrigation water samples. The detection of both total and fecal coliform bacteria was similar for all sampling areas. Overall, the majority of the samples were well within the Irrigation Guidelines for both total and fecal coliform bacteria levels.

Metal concentrations for samples collected for the three year sampling period were generally low at all sampling sites. Metal detection was relatively consistent over the three year sampling period. Three metals, beryllium, silver and tellurium, were not detected in any of the water samples and five metals, bismuth, cadmium, mercury, thallium and tin, were detected in a very small percentage (10%) of samples. Seven metals, arsenic, barium, manganese, molybdenum, nickel, strontium and uranium, were detected in all water samples and four metals, antimony, boron, iron and lithium, were detected in a very large percentage (90%) of the samples. Aluminum, boron, chromium, cobalt, iron, manganese, molybdenum, titanium and vanadium levels in the Lumsden sampling area were elevated slightly and showed a wider range in concentrations compared to the other sampling areas, possibly a result of higher total suspended solids. The Irrigation Guideline was exceeded in one sample for aluminum, chromium and iron (<1%) and in four samples for manganese (2%). The Irrigation Guideline for the metals are based on toxicity when used on a continuous basis, therefore occasional violations should not be a cause for concern.

Pesticide levels were generally low. Pesticide analyses indicated that of the 18 herbicides tested for only six were detected. The frequency of detection was 2,4-D (96%) > MCPA (26%) > Dichloroprop (16%) > Dicamba (6%) > Bromoxynil (3%) > Mecoprop (2%). The Irrigation Guideline was exceeded in 39 samples (23%) for MCPA and in 10 samples (6%) for Dicamba. All other herbicides that were detected either had concentrations less than the Irrigation Guideline or there is no Irrigation Guideline available at present. Of the ten insecticides for which analysis was conducted none were detected in the water samples that were collected.

Comparison of analyses for samples collected using the grab sampler and automatic sampler (weekly integrated/composite samples) indicated that in general there was close agreement between the two sampling methods. Most discrepancies between the two sampling techniques occurred for the bacteria and herbicides analyses. Differences between the two sampling techniques could indicate the detection of spike concentrations of herbicides that could be missed by the grab sample technique which only provides an estimate of the concentration at one point in time. It is generally recommended that water samples collected for bacteria analyses be kept at a temperature of 4^0 C and be submitted for analyses within 24 hours. Using the automatic sampler method of collecting water samples for bacteria analyses is probably not a good idea since some sub-samples sit around at ambient temperature for periods up to 7 days. These conditions which are different from those in the water body from which the sample was taken could alter bacteria survival/growth and give erroneous results.

The irrigation water quality parameters monitored in this study were identical to those monitored in a similar irrigation water quality study in Alberta. This will allow for the development of a common irrigation water quality database for the prairie region. The establishment of this common database will facilitate the evaluation of the impact of intensive agricultural practices on surface water quality and the development of BMP's for irrigation source and receiving water protection.

Introduction

Contamination of surface waters with nutrients, bacteria and pesticides can increase with greater agricultural intensity (CASEA 1998). This can cause a wide array of human health problems and can adversely affect the safety of water for drinking, fisheries, industry, irrigation, livestock watering and recreation. Therefore, monitoring surface water quality is essential to ensure long-term, healthy and sustainable agricultural water supplies for food production, protection of the aquatic environment, and water supply expansion.

Water quality data from Alberta's Irrigation Districts has occasionally been collected and described. The most comprehensive description is the Review of Irrigation District Water Quality (Cross 1997). This report compiled historical water quality data from 1977 to 1996 within six irrigation districts (Bow River, Eastern, Lethbridge North, St. Mary River, Taber, Western). Source water quality of the irrigation districts usually met irrigation guidelines. In contrast, return flows more often violated irrigation guidelines, particularly for fecal coliform bacteria. Even though the data was variable, it clearly indicated that water quality changes as it moves through the irrigation districts, from source to return flows. Concentrations of salts, phosphorus and pathogens tended to increase, while nitrate and nitrite often decreased. Changes to water quality may relate to land use, land topography, instream reservoirs, climate, and season.

There are many factors that affect return flow quality, including flow volume and hydrology, land use and management, climate, and topography. Studies in Alberta have examined the impact of irrigation return flow on receiving streams or rivers (Greenlee et al. 2000; Ontkean et al. 2005). Results from these studies were inconclusive. Depending on the watershed, irrigation return flows might have negligible, detrimental or beneficial effects on receiving stream water quality.

In Saskatchewan a 3 year (1994-1996) intensive monitoring program was undertaken to assess the effects on the downstream water quality of the South Saskatchewan River due to herbicide and nutrient inputs via drainage water from the South Saskatchewan River Irrigation District No. 1 (Cessna et al. 2001). Herbicide concentrations in the drainage water did not exceed the Canadian water quality guidelines for drinking water or for livestock watering. Sometimes, however, irrigation guidelines were exceeded for dicamba and MCPA and frequently for 2,4-D. Occasionally, freshwater aquatic life guidelines were exceeded for MCPA and 2,4-D. Due to the large flows in the South Saskatchewan river, the receiving water body, inputs of herbicides did not significantly increase herbicide concentrations in the river water. With the exception of 2,4-D, river concentrations generally remained at least two orders of magnitude less than the lowest water quality guideline. Average ammonia concentrations in the drainage water were well below the Saskatchewan water quality objectives. Nitrate concentrations in the drainage water were always within Canadian water quality guidelines. Due to the large flows in the river, inputs of nutrients did not significantly increase nutrient concentrations in the river water and river concentrations of nitrate and ammonia remained well below water quality guidelines. Measurements of fecal bacterial content were not conducted in this study.

More recently (2005 and 2006), preliminary research conducted by the University of Regina at Lumsden, Saskatchewan, in collaboration with the Saskatchewan Vegetable Growers Association and Agriculture and Agri-Food Canada /Prairie Farm Rehabilitation Administration (AAFC/PFRA) (Larry Braul, PFRA, personnel communication) has identified incidences of *E. coli* contamination in the Qu' Appelle river that exceeded current guidelines for water quality of irrigation sources (100 fecal coliform CFU/100 ml – CCME 1999). This work demonstrated that the Qu'Appelle River is at risk of containing pathogenic microorganisms caused by fecal contamination of the watershed. Irrigation of vegetable crops with this water has the potential for impacting food safety and may pose health risks if disease-causing pathogens arising from fecal contamination are transferred from contaminated food products to consumers.

In Alberta and Saskatchewan irrigation water quality data has been collected to address varying study objectives using different sampling methods, frequencies of sampling, water quality parameters and laboratory analyses. As a result, available data are not consistent or complete across jurisdictions. Therefore, long-term trends of water quality changes cannot be discerned from these data. Recently Alberta Agriculture and Rural Development (AARD) conducted a project attempting to standardize water quality sampling procedures and analyses across all of Alberta's Irrigation Districts (Andrea Kalishchuk, personnel communication). This will allow for a comprehensive evaluation of the status of Alberta's surface water resources to ensure water quality protection for current and future irrigated agricultural practices. Future irrigation water monitoring projects in Saskatchewan's irrigation districts should follow the same protocol established in Alberta so that a common database can be developed. This common database will provide additional information to evaluate the impact of intensive cropping/livestock practices on surface water quality and the development of BMP's for irrigation source and receiving water protection.

Methods

Irrigation water quality sampling sites were selected in the spring of 2007 in four major areas of Saskatchewan: (1) Lake Diefenbaker Development Area (LDDA), (2) Saskatoon South East Water Suppy (SSEWS) system, (3) Moon Lake Irrigation District (down stream from LDDA and upstream from Saskatoon) and (4) the Qu'Appelle River in the Lumsden Valley (upstream and downstream from the junction of Wascana Creek and the Qu'Appelle River). The sites selected were modified from those originally considered in the project application. The location of the irrigation water quality sampling sites are as indicated in Figure 1. Specific GPS location coordinates for each sampling site are provided in Table 1 and plotted on a more detailed map for each area in Figures 2-6.

(A) LDDA

There were 7 sites selected for sampling in the LDDA. These sites were selected to follow the progression of the water from Lake Diefenbaker through the South Saskatchewan River Irrigation District No. 1 (SSRID No.1 - 35271 ac) with return flows going back to the South Saskatchewan River. The sampling sites were as follows:

(1) Riverhurst Pump Station (Plate 1) – water pumped from Lake Diefenbaker through a buried pressurized pipeline supplying the Riverhurst Irrigation District (9868 ac), a regional park and a local golf course.
(2) Luck Lake Pump Station (Plate 2) – water pumped from Lake Diefenbaker through a buried pressurized pipeline to the Luck Lake Irrigation District (8602 ac) and the Luck Lake Heritage Marsh.
(3) M1 Canal mid-point (Plate 3) – main canal delivering water from Lake Diefenbaker to the Broderick Reservoir as well as supplying water for irrigation in the southern part of the SSRID No.1. Water sampling site approximately half way between Lake Diefenbaker and the Broderick Reservoir.
(4) M2 Canal start-point (Plate 4) – canal delivering water from the Broderick Reservoir to the northern part of the SSRID No.1. Water sampling site in 2007 was approximately 500 m west of the outlet from the Broderick Reservoir. In 2008 and 2009 the sampling site was moved ~300 m east from the 2007 sampling location along the canal exiting from the west side of the Broderick reservoir. The sampling site was moved from under a canal overpass structure to ease access to the automatic sampler and ensure that the sampler was not subject to flooding when large flows were released from the Broderick reservoir.
(5) M2 canal mid-point (Plate 5) – approximately mid-point along the M2 canal between the Broderick Reservoir and the return flow outlet to the South Saskatchewan River.
(6) M2 canal end-point (Plate 6) – at the end of the M2 canal close to the point of the return flow outlet to the South Saskatchewan River.
(7) 1C Drain outlet (Plate 7) – at the end of the 1C Drain just before it enters the South Saskatchewan River. This is the main drain that collects the return flow water from the northern part of the SSRID No.1 and transports it to the South Saskatchewan River.

(B) SSEWS

The SSEWS system supplies water for recreation, industrial, municipal, wildlife and agricultural (including irrigation – 13953 ac) uses. The water is delivered by gravity from the Broderick Reservoir through a series of interconnecting canals and reservoirs southeast of Saskatoon terminating at the Dellwood Reservoir near Lanigan, Saskatchewan.

There were three sites selected for sampling in the SSEWS system. The sites selected were as follows:

(1) Brightwater Reservoir (Plate 8) – water source for individual irrigators.
(2) Blackstrap Reservoir (Plate 9) – water source for Hillcrest Irrigation District (3497 ac). Sample location at pump station.
(3) Bradwell Reservoir (Plate 10) - water source for individual irrigators.

(C) Moon Lake
This small irrigation district (1544 ac) south of Saskatoon, mainly produces high value crops such as turf grass, Saskatoon berries, market gardens, tree nurseries, potatoes and hybrid canola. This district is downstream from the SSRID No.1. Water is delivered from the South Saskatchewan River through a canal to Moon Lake, an old Oxbow lake, with the return flow from the lake going back to the river through a drainage canal.

There were two sites selected for sampling in the Moon Lake Irrigation District. The sites selected were as follows:

(1) Moon Lake Inlet (Plate 11) – point were water delivered from the South Saskatchewan River enters Moon Lake.
(2) Moon Lake Outlet (Plate 11) – drainage canal that delivers drainage water from Moon Lake back to the South Saskatchewan River.

(D) Qu'Appelle River in the Lumsden Valley
The Qu'Appelle River in the Lumsden Valley is an open water source used by vegetable growers for irrigation. Preliminary work in this area has identified incidences of fecal coliform bacteria contamination in the water that exceeded current guidelines for water quality of irrigation sources. Contamination of the Qu'Appelle river may be coming from intensive livestock operations as well as releases from sewage lagoons in the watershed. Irrigation of vegetable crops with this water has the potential for impacting food safety and may pose health risks if disease-causing pathogens arising from fecal contamination are transferred from contaminated food products to consumers.

There were two sites selected for sampling the Qu'Appelle River. The sites selected were as follows:

(1) Lumsden 1 (Plate 12) – south west of Disley upstream from the Wascana Creek inlet to the Qu'Appelle River.
(2) Lumsden 2 (Plate 13) – James St. Bridge in the town of Lumsden downstream from the Wascana Creek inlet to the Qu'Appelle River.

All locations were sampled at three times during each irrigation season for the three year period 2007-2009. The sampling dates were: 2007 - June 26/27, July 17 and August 14; 2008 – June 24, July 15 and August 5; 2009 – June 23, July 21 and August 11. These dates generally coincided with the peak irrigation demand during the growing season for each year. Grab samples were collected using an extension pole modified to hold a 2 liter plastic jug (Plate 14). In a separate study looking at the concentration of sulfonylurea herbicides in irrigation water conducted by Dr. Allan Cessna, National Water Research Institute, Saskatoon, Saskatchewan, automatic water samplers were used to collect samples at the same five locations within the SSRID No.1. Hourly sub-samples bulked over a 24 hour/daily period were collected using programmable automatic water samplers (Plate 15). Daily samples were then bulked to provide an integrated/composite weekly sample. A sub-sample of the weekly integrated/composite samples were collected from the three sampling dates each year of the three year period 2007-2009 for comparison with the grab samples. Grab samples only provide an estimate of the concentration of the various constituents in the irrigation water at a specific point in time. The weekly integrated/composite samples provide an integrated sample over time and should provide a more accurate estimate of the concentration of the various constituents in the irrigation water. This method of sampling would have a greater chance of detecting small chemical plumbs that may enter the water system over a short time period. All samples were collected using the same protocol (Appendix 1). The samples were kept at ~4^0C and transported to the appropriate analytical laboratory within 24 hours.

The water samples were analyzed to determine the concentrations of nutrients, metals, pesticides and coliform bacteria (Table 2). These same water quality parameters were monitored in Alberta's irrigation districts through an irrigation water quality monitoring program funded by Alberta Agriculture. Using the same water quality parameters as the Alberta project will allow for the development of a common irrigation water quality database for the prairie region. Nutrient, metal and bacteria analyses were conducted by ALS Laboratory Group, Analytical Chemistry & Testing Services, Environmental Division, a fully accredited laboratory for these analyses. The method for determining Total and Fecal Coliform bacteria was changed in 2008 to alleviate the problem with overgrowth that was observed during analyses on certain samples in 2007. Sample bottles and preservative for the nutrient, metal and bacteria analyses, were supplied by ALS Laboratory Group. Pesticide analyses were conducted by Dr. Claudia Sheedy, Research Scientist, AAFC Lethbridge Research Centre (LRC). Pre-cleaned amber glass sample bottles were provided by the LRC laboratory to ensure that there was no external pesticide contamination of the water samples. Pesticide concentrations in the irrigation water samples were quantitated and confirmed using gas chromatography interfaced with a mass selective detector (GC-MSD) (Appendix 2). Ethalfluralin, trifluralin and dimethoate were not included in the final water quality parameters as indicated in the original project proposal.

Water flow rate data was not collected as suggested in the original project proposal.

Meteorological data was collected from four Environment Canada weather stations that were in close proximity to the four sampling areas. This would allow determining the occurrence of extreme weather events and the effect of these events on water quality.

Results and Discussion

The detailed water sample analyses for the 14 sites at the three sampling dates for each year are as reported in Appendix 3 (2007), Appendix 4 (2008) and Appendix 5 (2009). A problem with the automatic sampler at the M2 END sampling site for the first sampling time in 2008 (June 24) resulted in only enough sample for pesticide analyses. Analytical values exceeding the current irrigation water quality guidelines are reported in bold type. Box and whisker plots showing the variability in data values for each parameter at all sampling sites over the three year sampling period 2007-2009 are presented in Appendix 6.

The suitability of water for irrigation must take into account several factors including salt content - EC, TDS; salt composition - SAR, HCO_3, CO_3; crop salt tolerance; specific ion effect - Na, Cl, B; bacteria – total coliform, fecal coliform; toxic metals – cadmium, mercury, lead, etc; and pesticides – 2,4-D, MCPA, Chlorpyrifos, etc (CCME, 1999; Saskatchewan Water Corporation; Saskatchewan Ministry of Agriculture, 2008). As well, soil characteristics such as salt content, sodicity, texture, structure, drainage, and geological unconformities must be considered. The integration of all of these factors along with the management of the water application and climatic factors provides an approximate guideline for determining irrigation suitability that maintains the sustainability of the irrigated land base and ensures a safe and healthy food supply.

Nutrients and Chemical

A summary of the analyses of the water samples collected for the three year period 2007-2009 indicated that quality for irrigation was generally good (Table 3). Salt content of the water samples was generally low with associated low SAR suggesting that all water sources were of good quality for use on most soil types according to current irrigation water-soil compatibility guidelines utilized in Saskatchewan (Saskatchewan Water Corporation; Saskatchewan Ministry of Agriculture, 2008). Electrical conductivity (Figure 1), a measure of salt content, total dissolved solids - a calculated value of salt content (Figure 2) and SAR values (Figure 3) of the water samples remained fairly stable for all sites throughout the three year sampling period. Salt content and SAR values were elevated slightly for the Moon Lake Irrigation District (Table 5), SSEWS (Table 6) and Lumsden Valley (Table 7) sampling areas compared to the LDDA sampling area (Table 4). Total dissolved solids were consistently higher for water samples collected from the Blackstrap and Bradwell reservoirs over the three year period (Figure 2). This indicates that there was some degradation in water quality as it passed through the SSEWS system compared to the source water in Lake Diefenbaker. The Moon Lake OUTLET and Lumsden-2 sampling sites had higher total dissolved solids in 2007 than in 2008 and 2009. Twenty two water samples (Blackstrap – 9; Bradwell – 7; Moon Lake OUTLET – 3; Lumsden-2 – 3) representing 13% (22 out of 170) of the samples collected for the three year sampling period had total dissolved solids greater than 500 mg L^{-1} which is just above the irrigation water guideline for sensitive crops but well within the irrigation water guideline for more tolerant crops (CCME 1999). Some loss of production could occur for salt sensitive crops at these slightly elevated total dissolved solids levels. The water samples collected from the LDDA sampling area were of excellent quality with none exceeding the total dissolved solids irrigation water quality guideline for sensitive crops (Table 4).

The range in concentrations of calcium, magnesium, sodium, potassium, chloride and sulfate, which make up the majority of the salt content of the water samples, showed little variability among sampling dates within each year and between years for the three year sampling period (Figures 4-9). As well, concentrations were relatively low, in agreement with the relatively low electrical conductivity and total dissolved solids observed (Table 3). Chloride concentration of all the water samples was well below the irrigation guideline for sensitive crops with the highest concentrations observed in 2007 in the Moon Lake and Lumsden sampling areas (Figure 8).

The pH of the water samples (Figure 10) ranged from 7.3-9.8 for water samples collected over the three year period 2007-2009 (Table 3). Higher pH levels, in excess of 9.0, were generally associated with the presence of carbonate. Carbonate (Figure 11) was only present in18% of the samples (Table 3), thus only a small percentage of samples were greater than pH 9.0.

Total alkalinity (Figure 12) and bicarbonate (Figure 13) concentrations of the irrigation water samples showed little variability among sampling dates within each year and for the three year sampling period for all sampling sites (Table 3).

Nutrient levels in the water samples collected were generally low. Total nitrogen was detected in 100% of the samples, ammonia in 26% of the samples, nitrate-N in 11% of the samples, nitrite-N in 4% of the samples, total P in 14% of the samples and inorganic P in 22% of the samples for the three year sampling period 2007-2009 (Table 3). Total N was generally low with the following exceptions: 2007 - July 17 sampling date at the Brightwater sampling site and the August 14 sampling date for the Bradwell sampling site; 2008 – August 5 sampling date for the Moon Lake Outlet sampling site; 2009 – June 23 sampling date for the Lumsden-2 sampling site (Figure 14). Ammonia-N concentration in the water samples was low and was observed more frequently in samples collected in 2007 and 2008 than in samples collected in 2009 (Figure 15). Ammonia was detected more frequently in the Moon Lake, SSEWS and Lumsden sampling areas (30-33% detection) than in the LDDA sampling area (22% detection). Highest ammonia-N concentrations were observed for the July 17 sampling date at the Brightwater reservoir sampling site in 2007 and the June 23 sampling date at the Lumsden-2 sampling site in 2009. Nitrate-N was only detected in samples from the LDDA (Table 4) and Lumsden (Table 7) sampling areas with the highest detection frequency occurring for the Lumsden sampling area. Nitrate-N was detected at the Lumsden-2 sampling site each year of the three year sampling period (Figure 16). The highest concentrations of nitrate-N were also observed at the Lumsden-2 sampling site. There was no nitrate-N detected in samples collected from the Moon Lake or SSEWS sampling areas. Nitrite-N was only detected in two samples from the M2-START-AS sampling site in 2007 and 2008 and in four samples from the Lumsden-2 sampling site in 2007 and 2009 (Figure 17). Total and inorganic phosphorus was detected more frequently in samples from the SSEWS (Table 6) and Lumsden (Table 7) sampling areas than the LDDA (Table 4) or Moon Lake (Table 5) sampling areas. Detection of total and inorganic phosphorus followed the same trends with the detection frequency occurring in the order 2007>2009>2008 (Figures 18 and 19). Highest concentration of total phosphorus was detected at the Brightwater reservoir sampling site in 2007 and 2009. Inorganic phosphorus concentrations were low with the highest concentration occurring at the Brightwater reservoir in 2009.

Similar ranges in total nitrogen, nitrate nitrogen, nitrite nitrogen, total phosphorus, inorganic phosphorus, sulfate and chloride found at the Riverhurst and Luck Lake sampling sites on Lake Diefenbaker in the present study were also found in a study focusing on the nutrient content and nutrient limitation of algal growth in Lake Diefenbaker conducted in 2008 (Giesy et al. 2009). The Geisy et al. (2009) study concluded that Lake Diefenbaker was in a moderate state of eutrophication with total phosphorus identified as the limiting factor while total nitrogen was indicated not to be a limiting factor in algal production. Phosphorus input was suggested to come from upstream sources.

Total suspended solids, an indication of the turbidity or suspension load of the water samples, were detected in all samples collected from the Lumsden sampling area for the three year sampling period (Table 7). There is obviously a high sediment load in the Qu'Appelle River. The only other samples that contained significant total suspended solids were from the Riverhurst and Luck Lake sampling sites in 2009 (Figure 20). The highest load of suspended material as measured by total dissolved solids was observed for the June 23 sampling date at the Riverhurst sampling site in 2009. The total dissolved solids measured were in general agreement with the visual water turbidity ratings observed at the time of sampling (Appendix 3-5).

Bacteria

Total and fecal coliform bacteria were detected in 86% and 75% respectively of the samples collected for the three year period 2007-2009 (Table 3). The detection of both total and fecal coliform bacteria was similar for all sampling areas: LDDA – 85% and 75% (Table 4); Moon Lake – 100% and 94% (Table 5); SSEWS – 89% and 52% (Table 6); Lumsden – 79% and 89% (Table 7). A wide range in the quantity of coliform bacteria was detected, however only 4 samples exceeded the Irrigation Guideline for total coliforms (Figure 21) and 11 samples exceeded the Irrigation Guideline for fecal coliforms (Figure 22). The samples in which total coliforms exceeded the Irrigation Guideline were collected at the following sites: 2008 - M2 END sampling site in the LDDA sampling area from the automatic sampler for the July 15 sampling time; 2009 - the Moon Lake OUTLET sampling site in the Moon Lake sampling area and the Lumsden-2 sampling site in the Lumsden sampling area for the June 23 sampling time and the Bradwell reservoir sampling site in the SSEWS sampling area for the July 21 sampling time (Figure 21). The samples collected at the Moon Lake OUTLET and Lumsden-2 sampling sites for the June 2 sampling time had extremely high total coliform levels of 9300 and 23000 MPN/100 ml respectively. The source of these high levels of total coliform bacteria are not known.There were no total fecal coliform levels in samples that exceeded the Irrigation Guideline for total coliforms from samples collected in 2007. However, six samples collected in 2007 and measured for total coliforms had overgrowth by bacterial colonies and as a result a detection level could not be reported. The eleven samples that had fecal coliform levels that exceeded the Irrigation Guideline were collected at the following sites: 2007 - M2 END Grab sample for the August 14 sampling time; 2008 - Riverhurst, M2 END Grab sample and Lumsden-2 sampling sites for the July 15 sampling time; 2009 – Blackstrap reservoir and Lumsden-2 sampling sites for the June 23 sampling time, Moon Lake OUTLET sampling site for the July 21 sampling time and Riverhurst, Moon Lake OUTLET, Bradwell reservoir and Lumsden-2 sampling sites for the August 11 sampling time (Figure 22). Both total and fecal coliform bacteria levels detected were lower in 2007 than in 2008 and 2009. This is possibly due to the fact that the method used in 2007 for measuring colifom bacteria was changed and a more sensitive method was used in 2008 and 2009. There were no observed seasonal trends in total or fecal coliform levels in the irriagtion water samples. Incidences where total and fecal coliform bacteria exceed the Irrigation Guideline could cause concern for use on crops such as vegetables that are consummed raw. Overall, the majority of the samples were well within the Irrigation Guidelines for both total (Figure 21) and fecal coliform (Figure 22) bacteria levels.

Metals

Metal concentrations for samples collected for the three year sampling period 2007-2009 were generally low at all sampling sites (Table 3). Metal detection was relatively consistent over the three year sampling period. Three metals (Be, Ag, Te) were not detected in any of the water samples and five metals (Bi, Cd, Hg, Tl, Sn) were detected in a very small percentage (10%) of samples. Seven metals (As, Ba, Mn, Mo, Ni, Sr, U) were detected in all water samples and four metals (Sb, B, Fe, Li) were detected in a very large percentage (90%) of the samples. Of the 28 metals analyzed for, 25 were detected in the LDDA sampling area (Table 4), 21 were detected in the SSEWS (Table 6) and Lumsden (Table 7) sampling areas and 20 were detected in the Moon Lake (Table 5) sampling area. Of the 21 metals detected in the Lumsden sampling area 19 were detected in 100% of the samples collected (Table 7). Aluminum, boron, chromium, cobalt, iron, manganese, molybdenum, titanium and vanadium levels in the Lumsden sampling area were elevated slightly and showed a wider range in concentrations compared to the other sampling areas. Higher values of metals tend to be associated with high sediment loads due to the natural mineral composition of sediment particles. For this reason the slightly elevated metal content of the water samples from the Lumsden sampling area could possibly be associated with the higher total suspended solids observed in these samples. Iron concentration was exceptionally high in the June 27 sample at the M1-G sampling site in 2007. As well, elevated iron concentrations were detected in the June 27 samples at the Riverhurst and Luck Lake sampling sites in 2007. The Irrigation Guideline was exceeded in one sample for aluminum (Figure 23), chromium (Figure 24) and iron (Figure 25) and in four samples for manganese (Figure 26). The Irrigation Guideline was not exceeded for arsenic (Figure 27), boron (Figure 28), cobalt (Figure 29), copper (Figure 30), lead (Figure 31), lithium (Figure 32), molybdenum (Figure 33), nickel (Figure 34), selenium (Figure 35), uranium (Figure 36), vanadium (Figure 37) and zinc (Figure 38). No Irrigation Guideline is available for antimony (Figure 39), barium (Figure 40), strontium (Figure 41) or titanium (Figure 42) however, the concentrations detected were relatively low for these metals. The Irrigation Guidelines for metals are based on toxicity when used on a continuous basis, therefore occasional vilolations should not be a cause for concern.

Pesticides (Herbicides and Insecticides)

Pesticide analyses indicated that of the 18 herbicides tested for only six were detected (Table 3). For the three year sampling period 2007-2009, 2,4-D (Figure 43), MCPA (Figure 44) and Dichloroprop (Figure 45) were detected in all sampling areas, Dicamba (Figure 46) was detected in the Moon Lake, SSEWS and Lumsden sampling areas, Bromoxynil (Figure 47) was detected in the Moon Lake and Lumsden sampling areas and Mecoprop (Figure 48) was detected in the Lumsden sampling area (Tables 4-7). The frequency of detection of the herbicides in the water samples collected over the three year sampling period was 2,4-D 96%, MCPA 26%, Dichloroprop 16%, Dicamba 6%, Bromoxynil 3% and Mecoprop 2% (Table 3). The Irrigation Guideline was exceeded in 39 of the 45 samples (87%) in which MCPA was detected and in all 10 samples (100%) in which Dicamba was detected. All other herbicides that were detected either had concentrations less than the Irrigation Guideline or there is no Irrigation Guideline available at present. Of the ten insecticides for which analysis was conducted none were detected in the water samples that were collected.

In the LDDA sampling area only 2,4-D was detected at the Riverhurst and Luck Lake sampling sites on Lake Diefenbaker (Figure 43). In addition to 2,4-D, MCPA and Dichloroprop were detected within the SSRID No.1 of the LDDA sampling area. MCPA was detected at all sampling sites for the June sampling date in 2007 and 2008 as well as the July sampling date at the1C Drain sampling site for 2008 (Figure 44). MCPA was only detected at the M2-START sampling site for the July sampling date in 2009. Dichloroprop was detected at all sampling sites for the June sampling date in 2007 and 2008, except for the M2-END site in 2008 (Figure 45). There was no detection of Dichloroprop at any of the SSRID No.1 sampling sites in 2009. The M2-END sampling site showed elevated concentrations of 2,4-D all three years compared to the other sites within the SSRID No.1. The return flow water from the 1C Drain to the receiving water of the South Saskatchewan River has been altered slightly with the addition of herbicides as compared to the original water pumped from Lake Diefenbaker. This indicates that the irrigation water has picked up additional herbicides as it has moved from Lake Diefenbaker through the SSRID No.1. Previous studies on herbicide content of return flows to the South Saskatchewan River from the SSRID No.1 indicated that the small drainage volumes entering the river would be diluted by the large river flows and should not be a problem for downstream users (Cessna et al, 1997; Cessna et al, 2001). However, it was noted in these studies that irrigation management practices should be continuously monitored and assessed to further reduce herbicide inputs to water bodies from irrigation drainage and return flow water. No other trends were observed as to changes in herbicide detection or concentration during the three year sampling period in the LDDA sampling area.

In the Moon Lake Irrigation District sampling area, that is down stream from the LDDA sampling area, 2,4-D was detected at both the INLET and OUTLET sampling sites for all sampling dates of the three year sampling period (Figure 43). The concentration of 2,4-D was slightly greater for the samples collected at both sampling sites for the first two sampling dates in 2007 as compared to the Riverhurst and Luck Lake pump station sampling sites on Lake Diefenbaker. MCPA was detected at both the INLET and OUTLET sampling sites for the three year period but not at all sampling dates (Figure 44). The MCPA concentration was slightly lower in 2009 compared to 2007 and 2008. All MCPA detections in 2007 and 2008 exceeded the Irrigation Guideline. Dichloroprop was detected at both the INLET and OUTLET sampling sites for the June sampling date in 2007 and at the INLET sampling site for the July sampling date in 2008 (Figure 45). There was no detection of Dichloroprop in 2009. Bromoxynil was only detected at the OUTLET sampling site for the June sampling date in 2008 (Figure 47).

In the SSEWS sampling area, that receives water from the Broderick Reservoir in the LDDA sampling area, 2,4-D was detected at all three sampling sites for the three year sampling period 2007-2009 (Figure 43). The concentration of 2,4-D was slightly greater for the samples from the Brightwater Reservoir sampling site as compared to the Riverhurst and Luck Lake pump station sampling sites on Lake Diefenbaker. MCPA was detected at all three sites in 2007 and at the Brighwater and Bradwell sampling sites in 2008 and 2009 (Figures 44). Concentration of MCPA detected was elevated slightly for the Bradwell reservoir sampling site in 2007 and the Brightwater reservoir in 2009 compared to the other sampling sites within the SSEWS sampling area. All but one sample exceeded the Irrigation Guideline for MCPA. Dichloroprop was only detected at the Brightwater sampling site in 2007 and 2008 and at the Bradwell sampling site in 2007 (Figure 45). Dicamba was only detected at the Brighwater reservoir sampling site for the July and August sampling dates in 2009 (Figure 46). No other trends were observed as to changes in herbicide detection or concentration during the sampling period in the SSEWS sampling area.

In the Lumsden Valley sampling area, 2,4-D was detected at both sampling sites for the three year period 2007-2009 (Figure 43). The concentration of 2,4-D was elevated slightly for the Lumsden-2 sampling site compared to the Riverhurst and Luck Lake pump station sampling sites on Lake Diefenbaker. In addition, MCPA (Figure 44) and Dichloroprop (Figure 45) were detected in samples from both the Lumsden-1 and Lumsden-2 sampling sites but not consistently at all sampling dates. MCPA was detected in 2007 and 2008 while Dichloroprop was detected in all three years of the sampling period. As well, the greatest detection frequency for Dichloroprop was at the Lumsden-2 sampling site. Dicamba (Figure 46) was only detected at the Lumsden-2 sampling site. All Dicamba detections exceeded the Irrigation guideline. The concentration of 2,4-D was lower for the Lumsden-1 sampling site which is on the Qu'Appelle River upstream from the junction with the Wascana Creek. This plus the fact that other herbicides were detected in samples from the Lumsden-2 sampling site compared to the Lumsden-1 sampling site would indicate that water from the Wascana

Creek entering the Qu'Apppelle River was a potential source of the other herbicides. The Wascana Creek drains an area that includes intensive livestock operations and various industrial operations as well as receives releases from sewage lagoons, all potential sources of contaminants. No other trends were observed as to changes in herbicide detection or concentration during the sampling period in the Lumsden Valley sampling area.

A review of irrigation district water quality in Alberta suggested that precipitation events and patterns can influence the pattern of herbicide detection (Cross 1997). A substantial precipitation event with high natural runoff from the local watershed can result in a deterioration of water quality. As well, in a wet year there was a more general release of herbicides into irrigation return flows and seasonal patterns were evident. In a drier year there were fewer detectable levels of herbicides, but several high concentrations measured during substantial precipitation events in the area. There were no similar patterns detected in the present study possibly due to the lower number of samples collected and the less frequent sampling interval utilized each year.

Grab Sample vs Auto Sampler Method

Comparison of analyses for samples collected using the grab sampler and automatic sampler (weekly integrated/composite samples) indicated that in general there was close agreement between the two sampling methods. Most noteworthy discrepancies between the two sampling methods for the three year sampling period were:

(1) 2007
- iron and manganese (M1 canal sampling site June 27) grab > integrated/composite sample
- 2,4-D (M2-END canal sampling site June 27) integrated/composite > grab sample
- 2,4-D (1C DRAIN sampling site June 27) grab > integrated/composite sample

(2) 2008
- 2,4-D (M2-END canal sampling site June 24) integrated/composite > grab sample
- total coliform (M2-END canal sampling site July 15) integrated/composite > grab sample
- total coliform (M2-END canal sampling site August 5) grab > integrated/composite sample

(3) 2009
- 2,4-D (M2-MID canal sampling site August 14) grab > integrated/composite sample
- 2,4-D (M2-END canal sampling site August 14) integrated/composite > grab sample

Most discrepancies between the two sampling techniques occurred for the bacteria and herbicides analyses. It is generally recommended that water samples collected for bacteria analyses be kept at a temperature of 4^0 C and be submitted for analyses within 24 hours. Using the automatic sampler method of collecting water samples for bacteria analyses is probably not a good idea since some sub-samples sit around at ambient temperature for periods up to 7 days. These conditions which are different from those in the water body from which the sample was taken could alter bacteria survival/growth and give erroneous results. On the other hand, integrated/composite samples (hourly/daily/weekly) should provide a more representative estimate of the total concentrations of herbicides that are moving through a water system such as an irrigation delivery/drainage canal compared to grab samples. Differences between the two sampling techniques could indicate the detection of spike concentrations of herbicides that could be missed by the grab sample technique which only provides an estimate of the concentration at one point in time.

Meteorological Data

Meteorological data from weather stations in close proximity to the irrigation water sampling areas indicated that there was one extreme rainfall event during the 2007 sampling period for July 20 at Lucky Lake and one for the 2008 sampling period for July 19 at Saskatoon that could have affected potential runoff to the sampling sites with potential to affect parameter levels in the water (Appendix 7-9). However, there was no observed increase in any of the measured water quality parameters in the water samples collected that could be associated with a specific weather event.

Temperature of samples measured at the time of sampling indicated a general trend of being higher for the July and August sampling dates than for the June sampling Date (Figure 49). Water sample temperature was elevated for the July sampling date in 2007. This coincides with a higher average monthly temperature for July in 2007 as compared to 2008 and 2009 (Appendix 7-9).

Conclusions and Reccommendations

The irrigation water quality analyses indicated that the water sampled in the four areas of Saskatchewan was generally of good quality for use on most soil types according to current irrigation water-soil compatibility guidelines utilized in Saskatchewan. Water samples from the Moon Lake Irrigation District, SSEWS and Qu'Appelle River in the Lumsden area had slightly elevated salt and SAR levels compared to the water in Lake Diefenbaker indicating a slight degradation in water quality the further it moved through the water delivery system. Nutrient, bacteria and metal levels in the water samples collected were generally low with some exceptions. Incidences where total and fecal coliform bacteria exceed the Irrigation Guideline could cause concern for use on crops such as vegetables that are consummed raw. There were no observed seasonal trends in total or fecal coliform levels in the irrigation water samples. The detection of both total and fecal coliform bacteria was similar for all sampling areas. Overall, the majority of the samples were well within the Irrigation Guidelines for both total and fecal coliform bacteria levels. Metal detection was relatively consistent over the three year sampling period. The detection of some metal levels in the Lumsden sampling area were elevated slightly and showed a wider range in concentrations compared to the other sampling areas, possibly a result of higher total suspended solids. Of the 18 herbicides analysed for 2,4-D was the only herbicide that was present in all water sources. All other herbicides were detected sporadically and showed no seasonal or yearly trends.

Long term trends in water quality are not obvious at this level of data analysis, however yearly variability in the data is demonstrated. There was no overall conclusion about seasonal trends in water quality that were evident.

This data provides reference levels for future irrigation water quality monitoring programs in Saskatchewan. The data should be made available for inclusion in an irrigation water quality database for the prairie region. The establishment of this common database will facilitate the evaluation of the impact of intensive agricultural practices on surface water quality and the development of BMP's for irrigation source and receiving water protection.

An ongoing irrigation water quality monitoring program should be established in order to document changes over time. The frequency of sample collection would vary depending on the parameters of concern. More frequent sampling is required to monitor colifrom bateria levels. Sample collection for coliform bacteria determination should probably be conducted on a weekly basis especially where there is concern of potential contamination of crops such as vegetables that are consummed raw.

Acknowledgements

The investigators thank B. Benson, Outlook, Saskatchewan for assistance in locating sampling sites within the South Saskatchewan Irrigation District No.1; Don David, CSIDC, Outlook, Saskatchewan for constructing the extension pole grab samplers; Kelly Farden, Ed Loewen and Stacy Gutek, Saskatchewan Agriculture, Outlook, Saskatchewan for assisting with the collection of water samples; Barry Derdall, Saskatchewan Agriculture, Outlook, Saskatchewan for preparation of the detailed sampling site location maps; David Gallen, Jeremy Nichols and Jonathon Bailey, NWRI, Saskatoon, Saskatchewan for automatic water sampler installation and collection of water samples from automatic samplers; and Dan Inaba, AAFC Lethbridge Research Centre, Lethbridge, Alberta for pesticide water sample preparation and analyses.

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Administrative and Other Aspects

Personnel involved:

(1) AAFC/AESB/CSIDC
Don David – responsible for constructing extension pole grab samplers.

(2) SA
Kelly Farden, Ed Loewen and Stacy Gutek – responsible for assisting with the collection of water samples.
Barry Derdall – responsible for preparation of detailed sampling site location maps.

(3) NWRI
David Gallen and Jeremy Nichols - responsible for automatic water sampler installation and collection of water samples from automatic samplers in 2007.
David Gallen and Jonathon Bailey - responsible for automatic water sampler installation and collection of water samples from automatic samplers in 2008.
David Gallen and Jeremy Nichols - responsible for automatic water sampler installation and collection of water samples from automatic samplers in 2009.

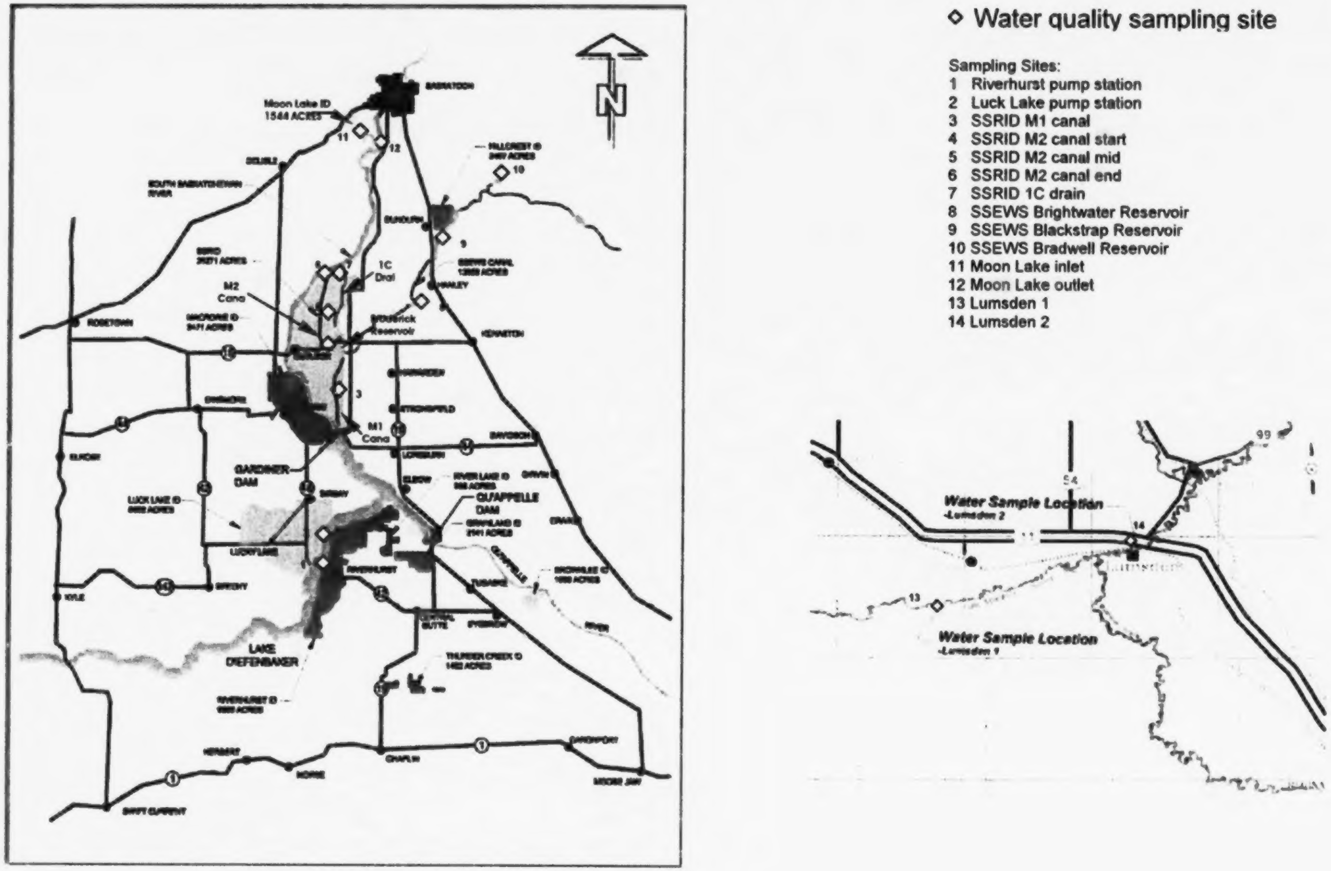
(4) AAFC/LRC
Dan Inaba – responsible for pesticide water sample preparation and analyses.

(5) AAFC/AESB
Bill Schutzman – replaced Larry Braul as a co-investigator in 2008. Larry Braul resigned form PFRA&E to accept a position with another department.
Serena McIver – replaced Bill Schutzman as a co-investigator in 2008. Bill Schutzman accepted the position of Assistant Director, Ag-Water Directorate, AAFC/AESB.

Financial statement:
A financial statement for the period March 31, 2007 – March 1, 2010 is provided in Table 3. The miscellaneous expenses incurred in 2007 were for materials for constructing three extension pole grab samplers (3 extension poles, 3 fire extinguisher holders, 3 tie down stretch cords and 6 plastic jugs). There was an increase in cost of analyses in 2009.

Table 1. Water sampling locations – GPS coordinates.

Location	UTM co-ordinates (Zone 13)		Decimal Degrees	
	Easting	Northing	Latitude	Longitude
Riverhurst	366131	5641626	50.91074	-106.90421
Luck Lake	363920	5652735	51.01006	-106.93979
M1 Canal	367451	5693610	51.37825	-106.90458
M2 Canal Start - 2007	365995	5703377	51.46568	-106.92918
M2 canal Start – 2008 & 2009	366140	5703391	51.46583	-106.92710
M2 Canal Mid	363411	5693717	51.56198	-106.96263
M2 Canal end	366694	5725203	51.66198	-106.92740
1CDrain outlet	368546	5726920	51.67785	-106.90128
Brightwater Reservoir	393608	5719177	51.61355	-106.53660
Blackstrap Reservoir	402915	5740799	51.80959	-106.40825
Bradwell Reservoir	419166	5754186	51.93250	-106.17572
Moon Lake Inlet	378072	5764994	52.02216	-106.77701
Moon Lake Outlet	380077	5763985	52.01353	-106.74745
Lumsden 1	494397	5606434	50.60976	-105.07918
Lumsden 2	509421	5610938	50.65022	-104.86673


N
Moon Lake ID
1544 ACRES
11
12
10
9
1C
Drai
M2
Cana
Brodrick
Reservoir
3
M1
Cana
GARDINER
DAM
QU'APPELLE
DAM
LAKE
DIEFENBAKER
99
54
11
14
13
Water Sample Location
-Lumsden 2
Water Sample Location
-Lumsden 1

◇ Water quality sampling site

Sampling Sites:
1 Riverhurst pump station
2 Luck Lake pump station
3 SSRID M1 canal
4 SSRID M2 canal start
5 SSRID M2 canal mid
6 SSRID M2 canal end
7 SSRID 1C drain
8 SSEWS Brightwater Reservoir
9 SSEWS Blackstrap Reservoir
10 SSEWS Bradwell Reservoir
11 Moon Lake inlet
12 Moon Lake outlet
13 Lumsden 1
14 Lumsden 2

Figure 1. Location of water sampling sites.

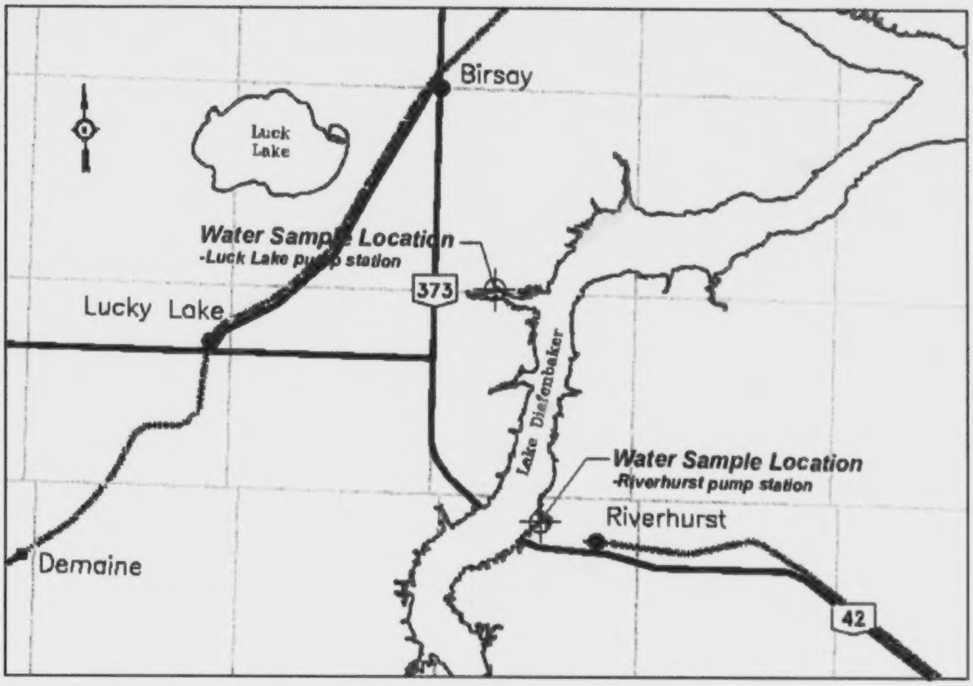

Birsay
Luck Lake
Water Sample Location
-Luck Lake pump station
373
Lucky Lake
Lake Diefenbaker
Water Sample Location
-Riverhurst pump station
Riverhurst
Demaine
42

Figure 2. Location of Riverhurst and Luck Lake sampling sites on Lake Diefenbaker.

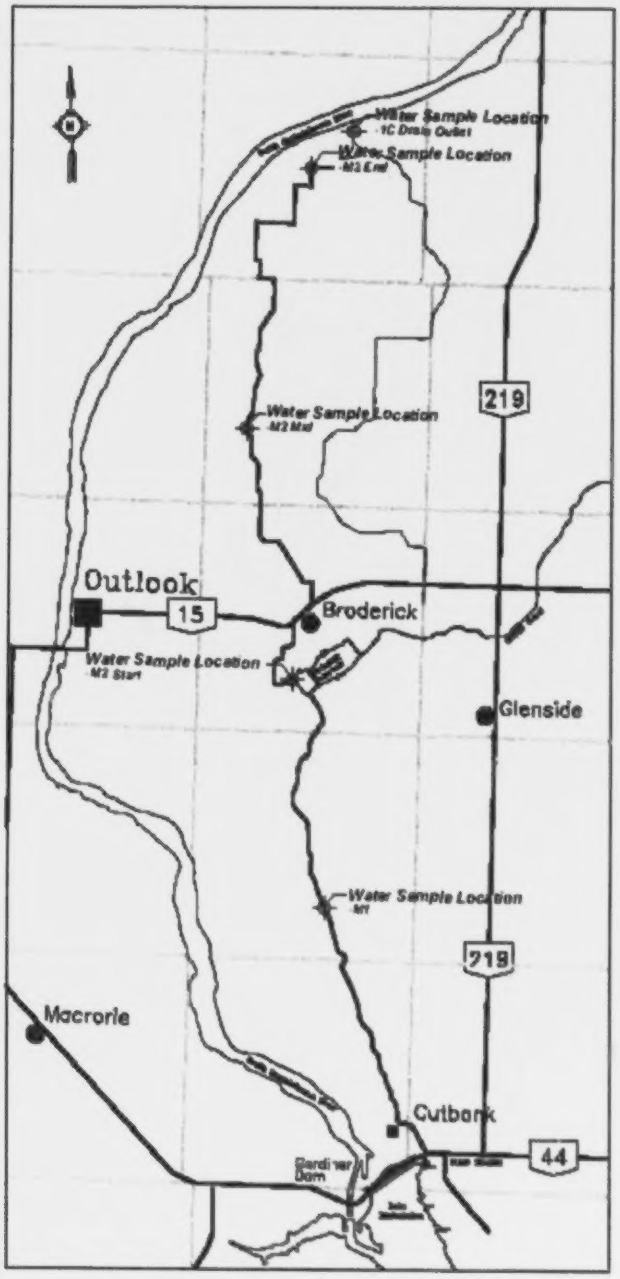

N
Water Sample Location
-1C Drain Outlet
Water Sample Location
-M2 End
219
Water Sample Location
-M2 Mid
Outlook
15
Broderick
Water Sample Location
-M2 Start
Glenside
Water Sample Location
-M1
219
Macrorie
Cutbank
Gardiner Dam
44

Figure 3. Location of sampling sites in the SSRID No. 1.

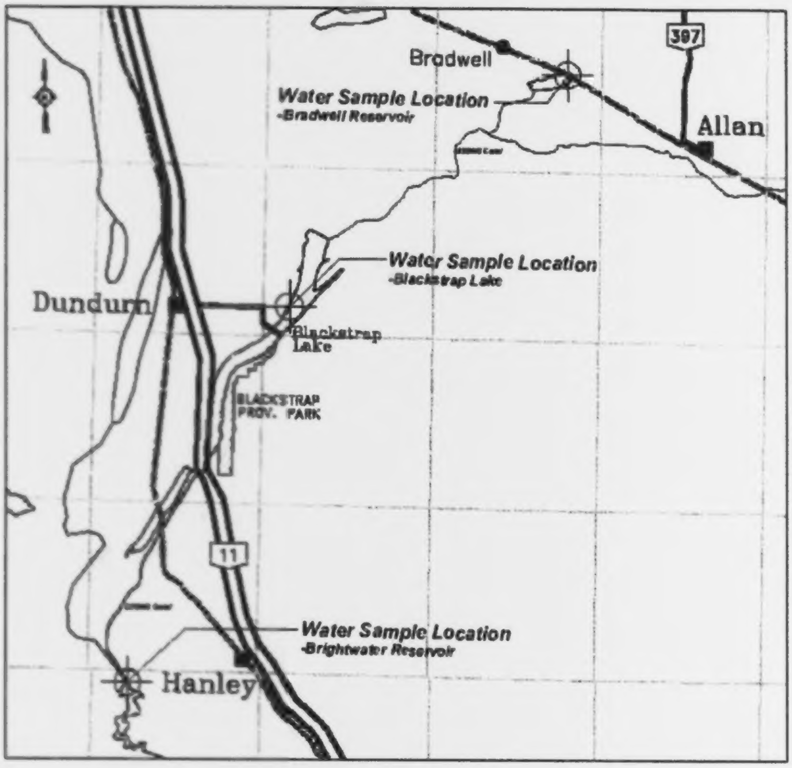
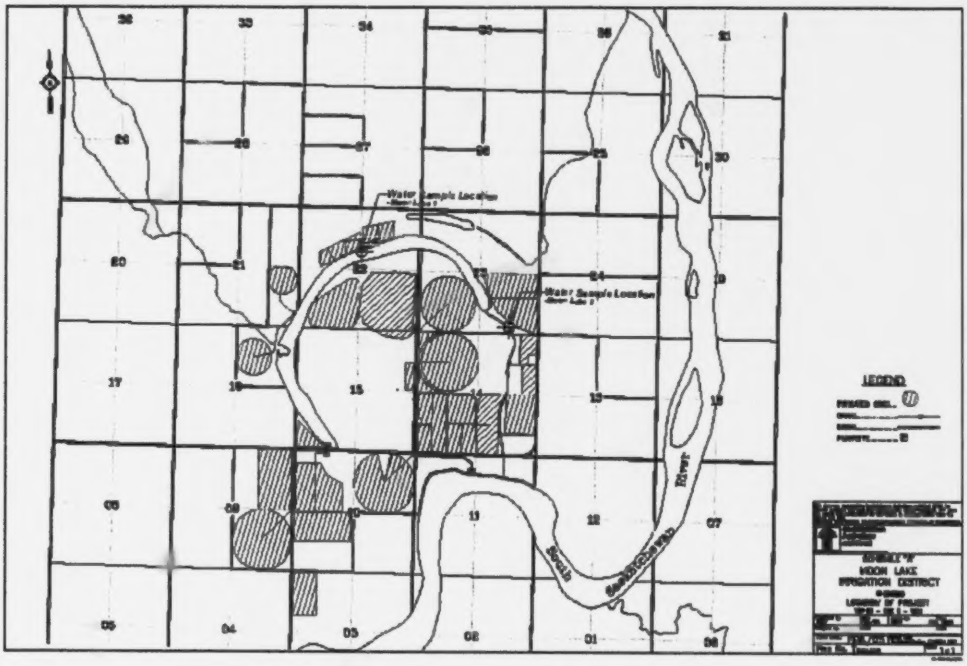

397
Brodwell
Water Sample Location
-Bradwell Reservoir
Allan
Water Sample Location
-Blackstrap Lake
Dundurn
Blackstrap
Lake
BLACKSTRAP
PROV. PARK
11
Water Sample Location
-Brightwater Reservoir
Hanley

Figure 4. Location of sampling sites in the SSEWS area.



35
34
33
32
31
28
27
26
25
30
Water Sample Location
20
21
22
23
24
19
Water Sample Location
17
16
15
14
13
18
LEGEND
08
09
10
11
12
07
South
River
MOON LAKE
IRRIGATION DISTRICT
05
04
03
02
01
06

Figure 5. Location of sampling sites in the Moon Lake Irrigation District.

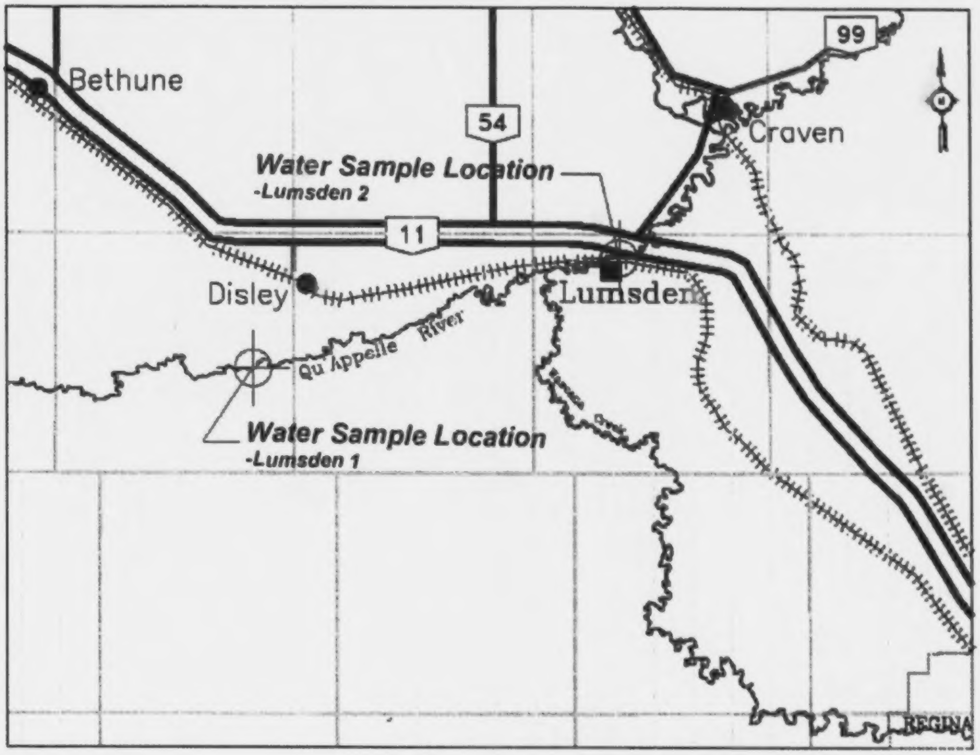

Bethune
54
99
Craven
Water Sample Location
-Lumsden 2
11
Disley
Lumsden
Qu'Appelle River
Water Sample Location
-Lumsden 1
REGINA

Figure 6. Location of sampling sites on the Qu'Appelle River in the Lumsden Valley.

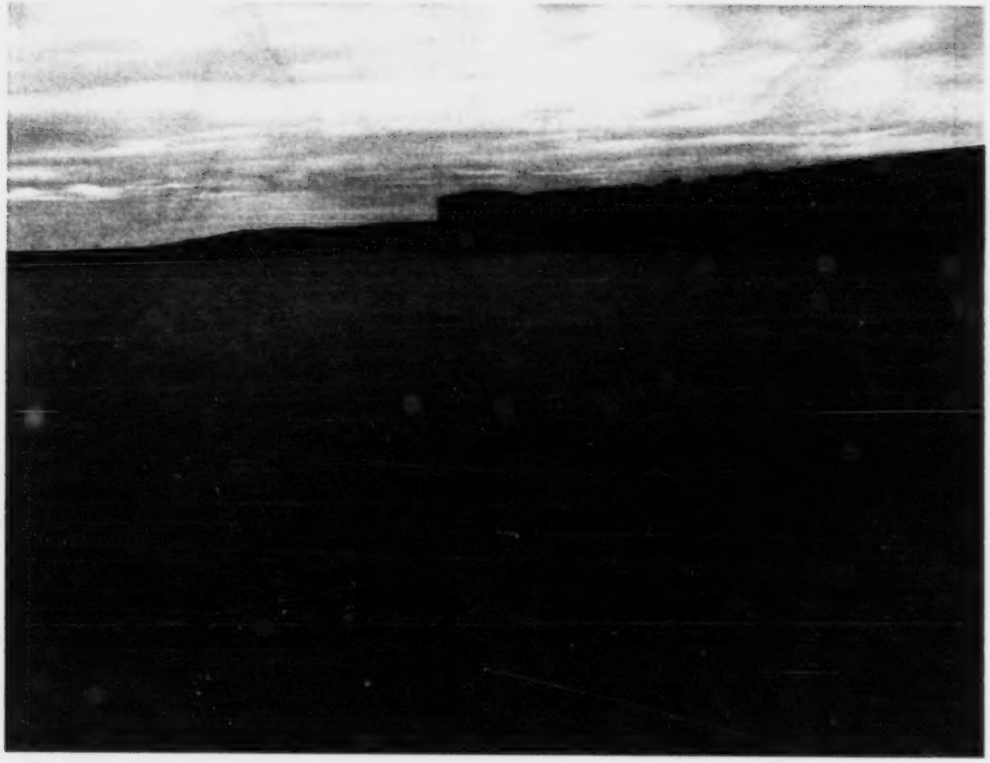


Plate 1. Lake Diefenbaker - Riverhurst pump station sampling site.

Plate 2. Lake Diefenbaker - Luck Lake pump station sampling site.

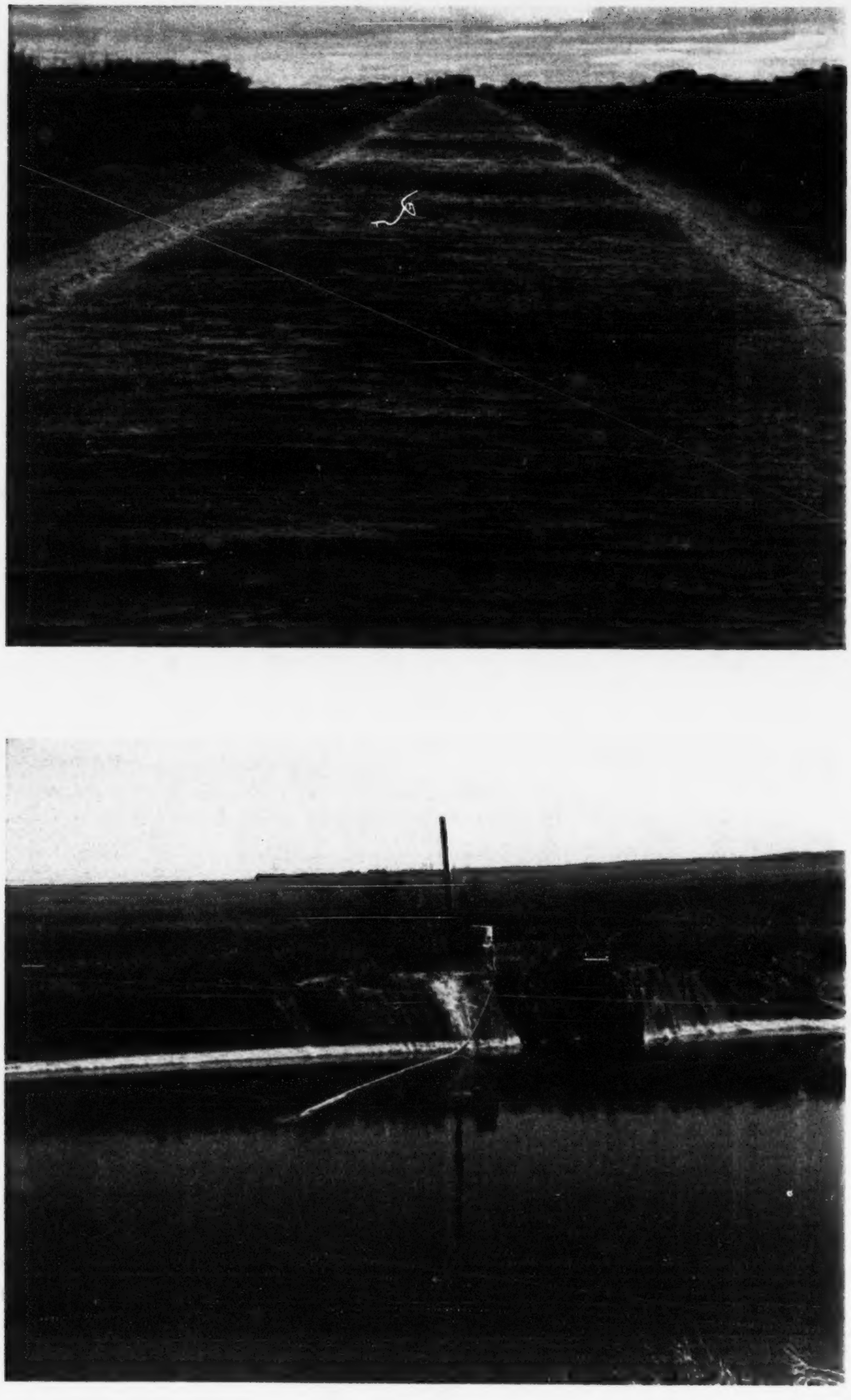


Plate 3. SSRID No.1 – M1 canal sampling site.

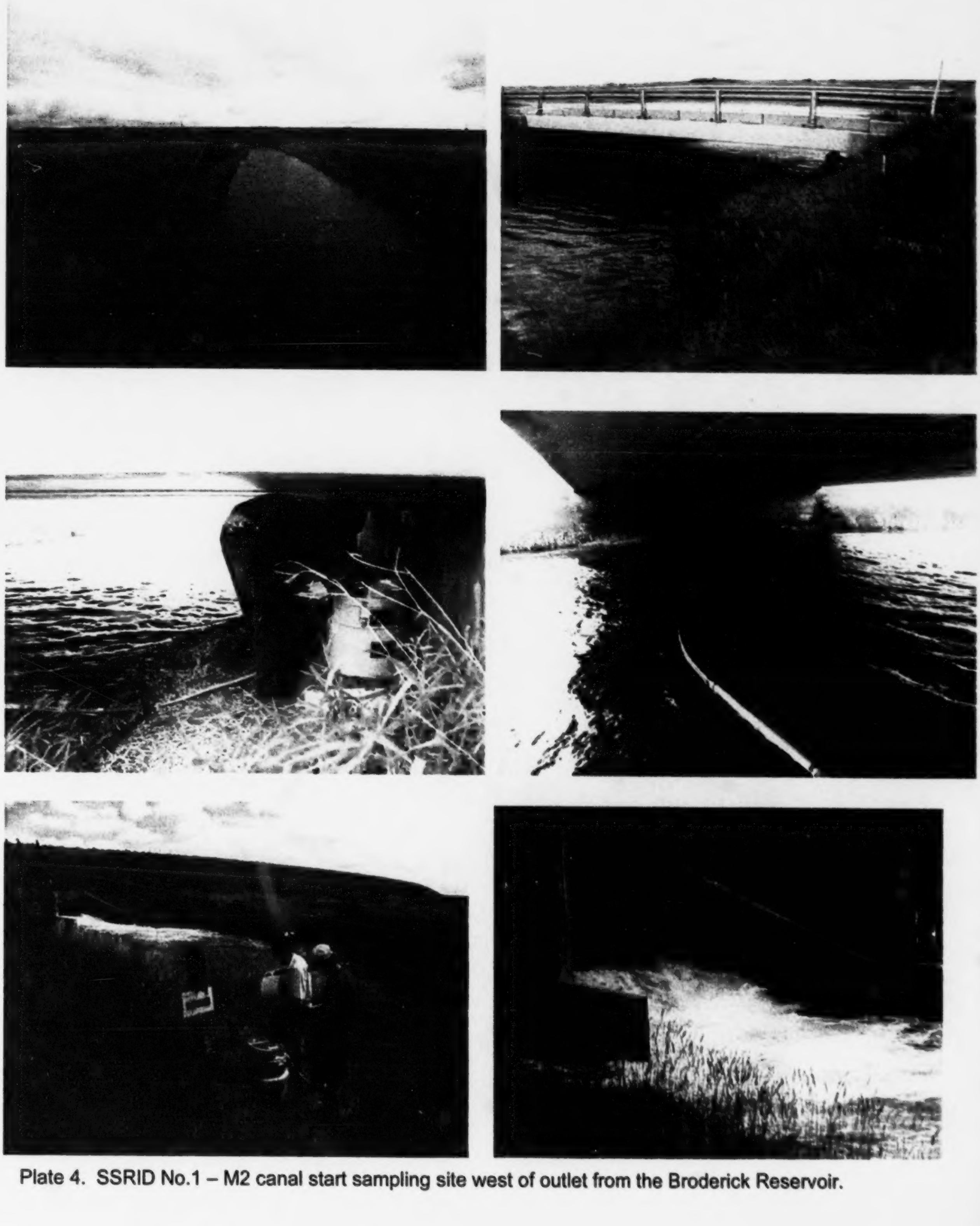


Plate 4. SSRID No.1 – M2 canal start sampling site west of outlet from the Broderick Reservoir.

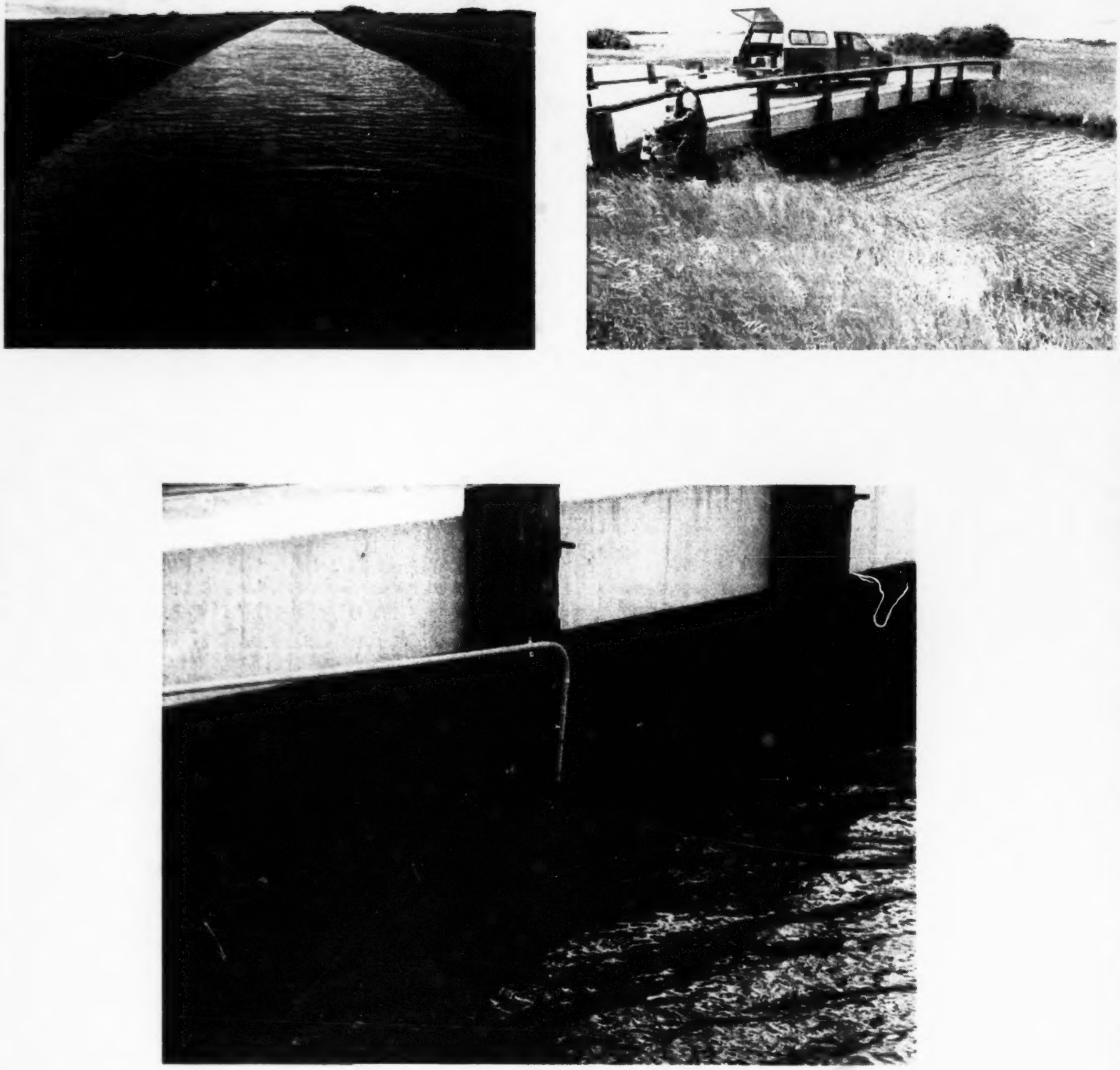


Plate 5. SSRID No.1 – M2 canal mid sampling site.

Plate 6. SSRID No.1 – M2 canal end sampling site.

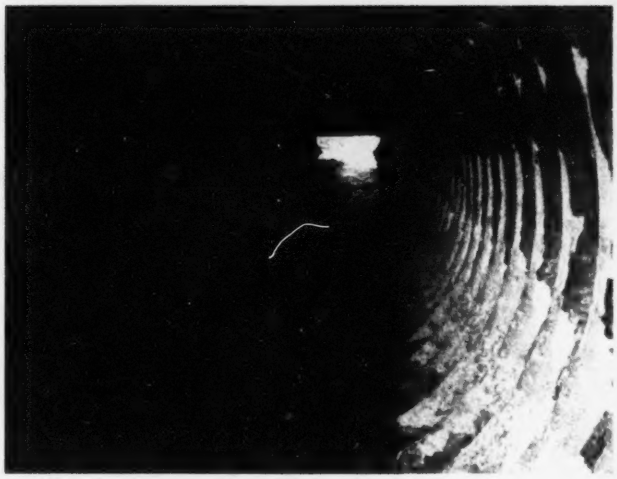


Plate 7. SSRID No.1 – 1C Drain outlet to South Saskatchewan River sampling site.

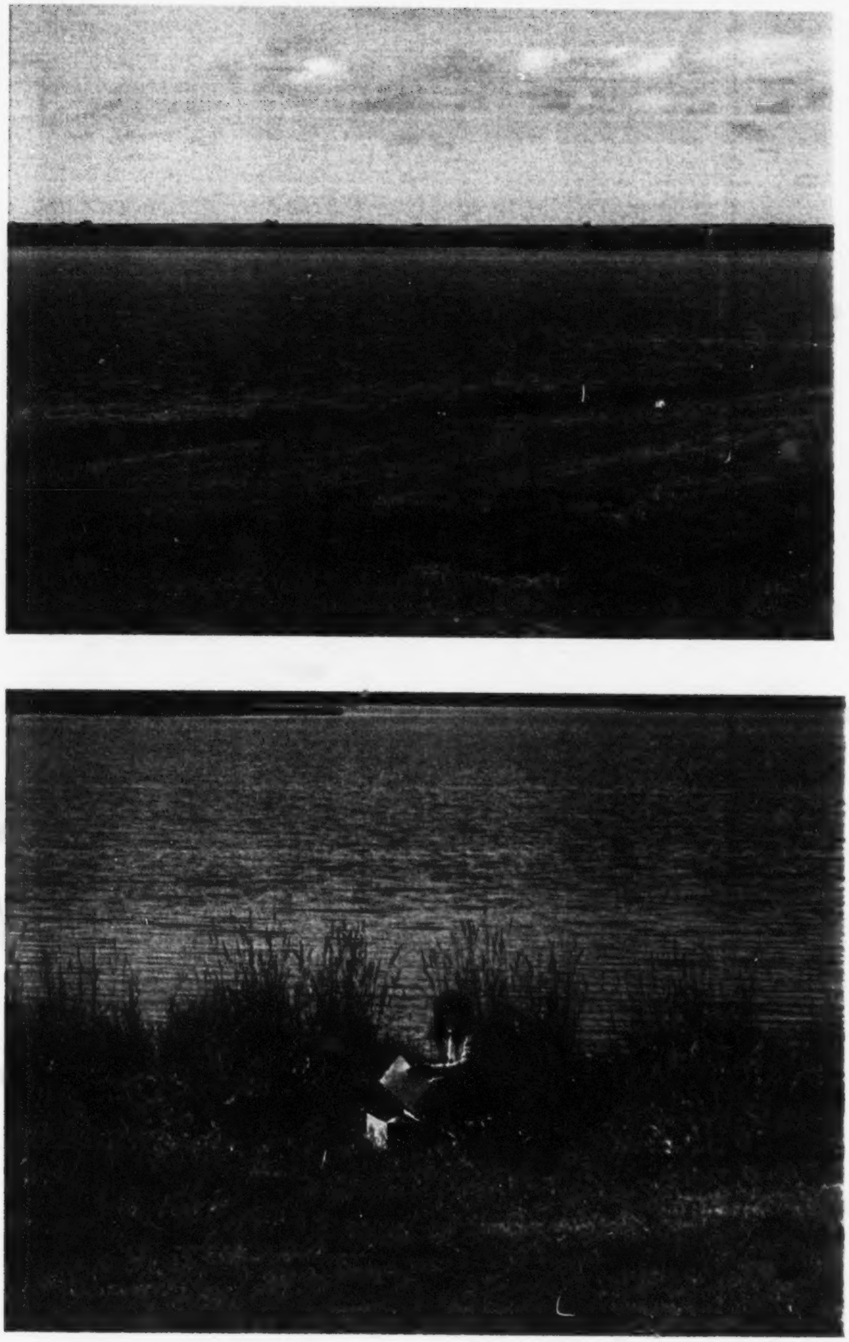


Plate 8. SSEWS - Brightwater Reservoir sampling site.

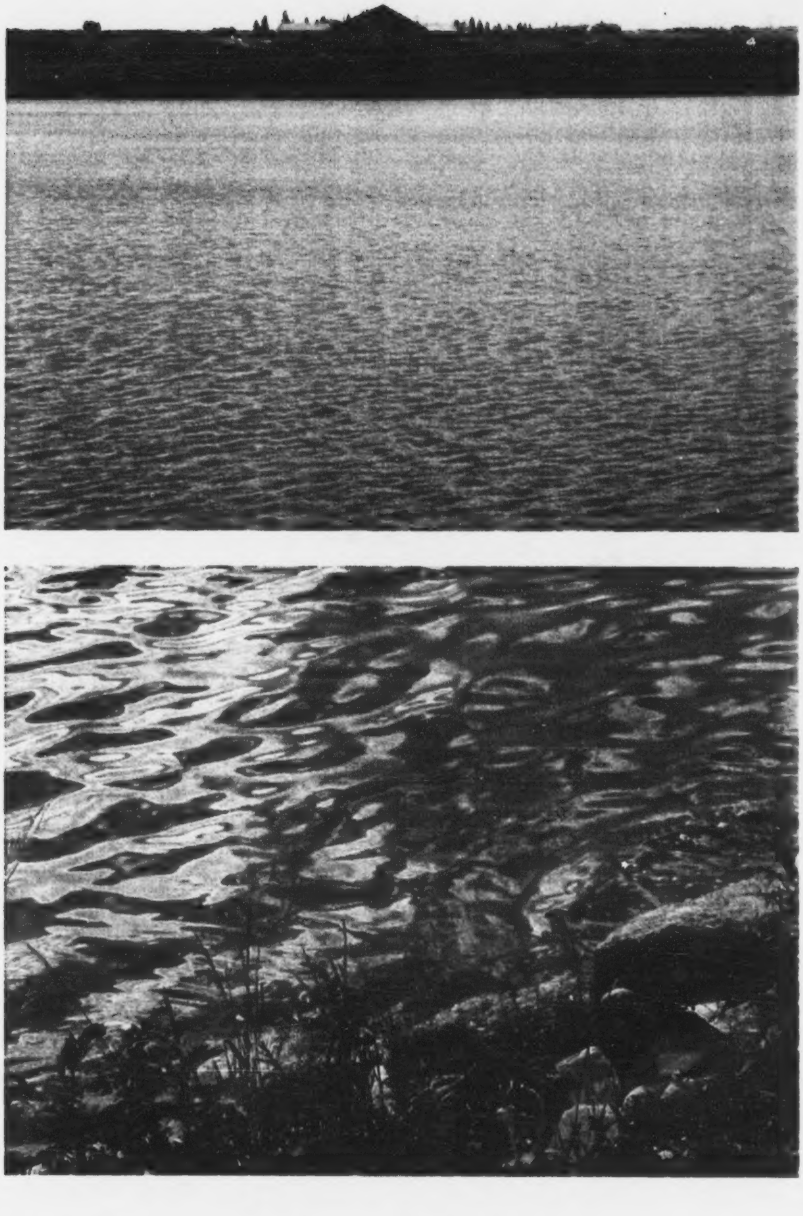


Plate 9. SSEWS – Blackstrap Reservoir sampling site.

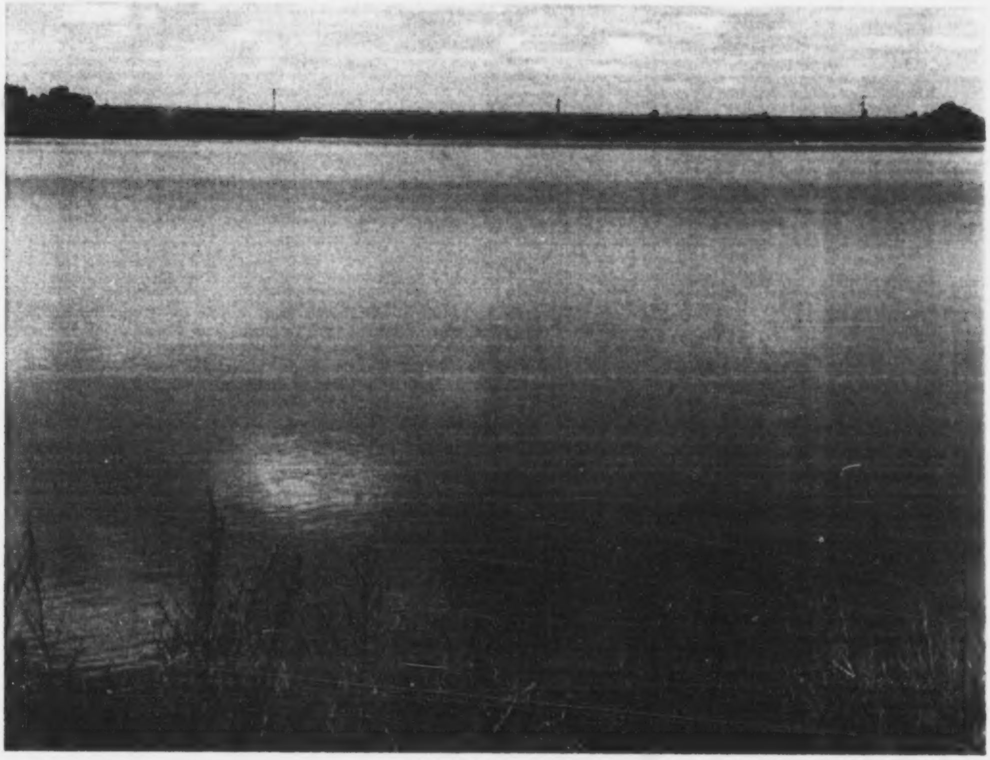


Plate 10. SSEWS – Bradwell Reservoir sampling site.

Plate 11. Moon Lake - INLET and OUTLET sampling sites.

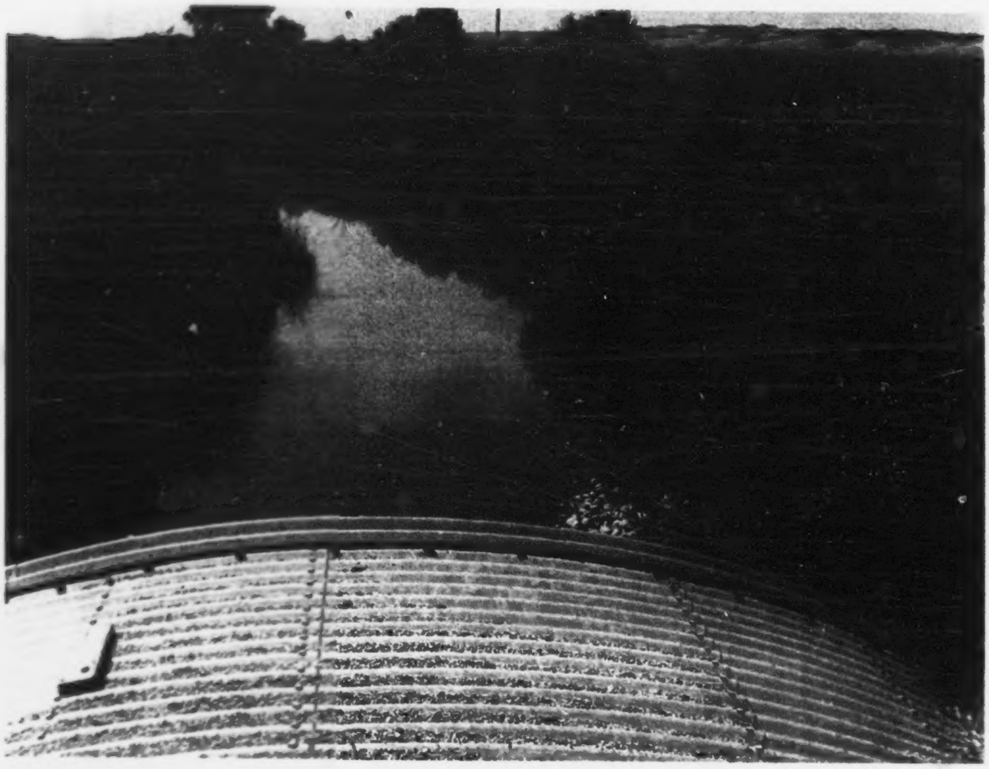


Plate 12. Qu'Appelle River - Lumsden 1 sampling site.

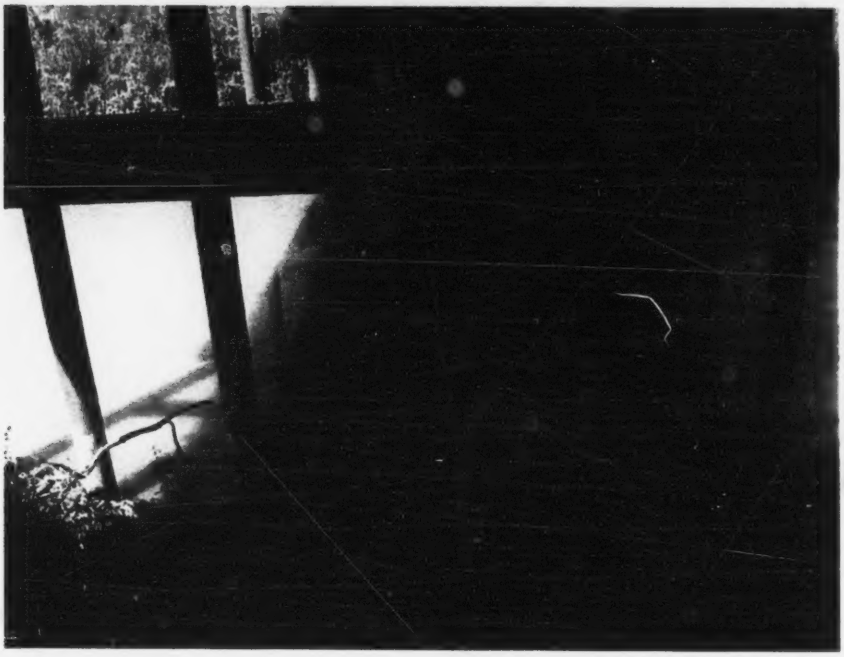


Plate 13. Qu'Appelle River – Lumsden 2 sampling site.

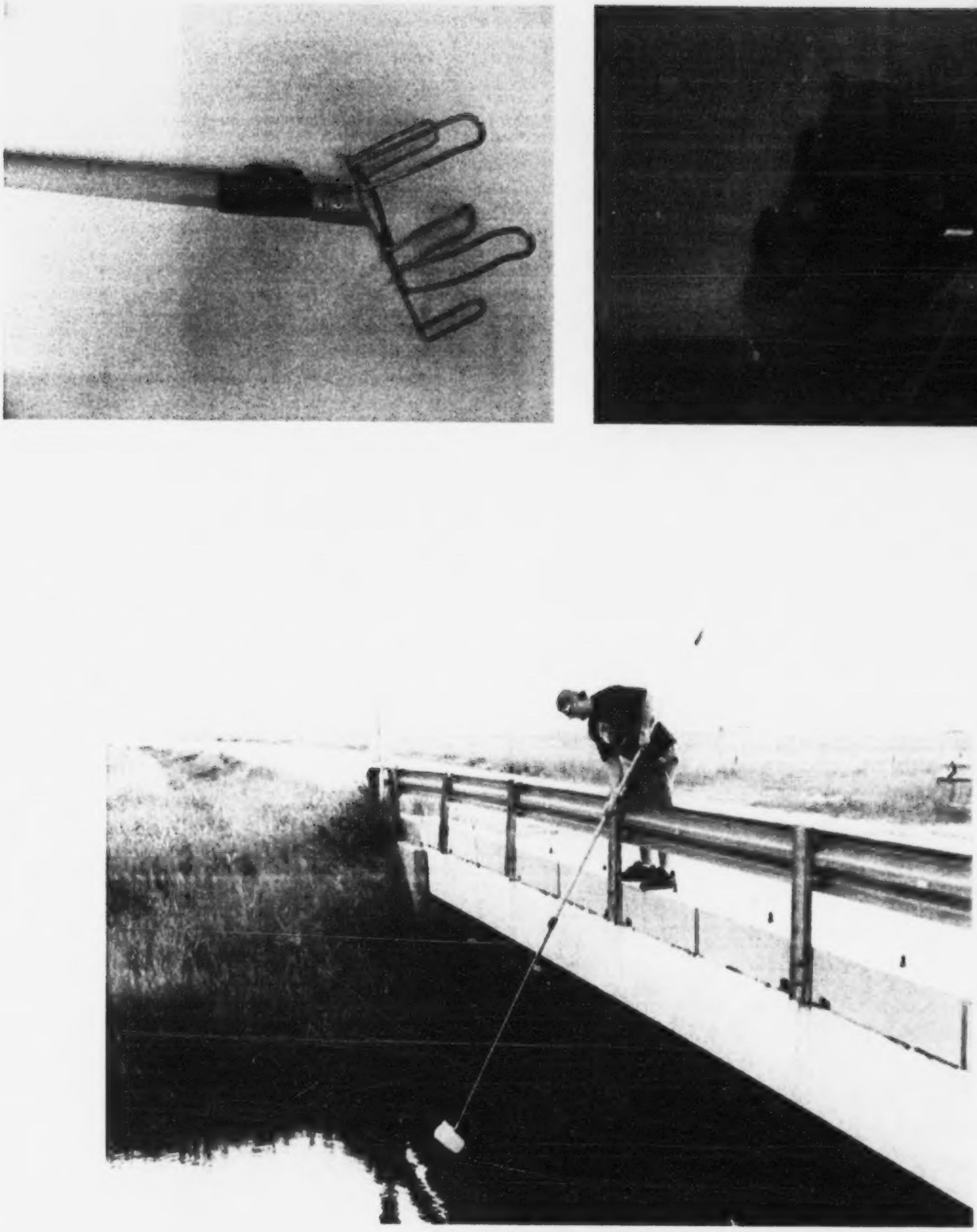


Plate 14. Extension pole sampler used for collecting grab water samples.

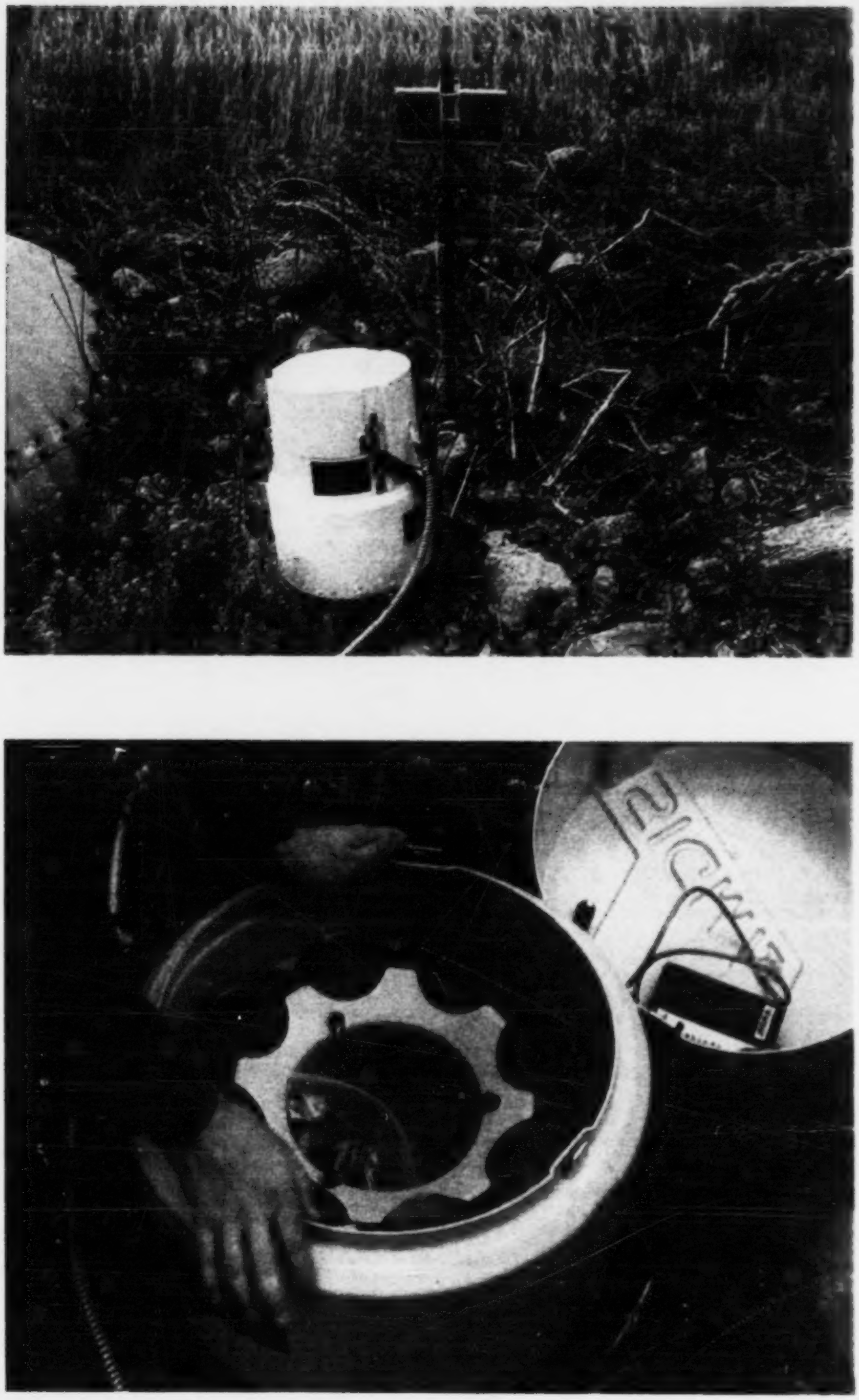


Plate 15. Automatic water sampler used for collecting integrated/composite water samples.

Table 2. Water Quality Parameters

Nutrients & Chemical	**Metals**	**Pesticides**	
Ammonia	Aluminum (Al)	**Herbicides**	**Insecticides**
Nitrate-Nitrogen	Antimony (Sb)	2,4-D	Aldrin
Nitrite-Nitrogen	Arsenic (As)	2,4-D,B	DDE
Total Kjeldahl Nitrogen	Barium (Ba)	Atrazine	Dieldrin
Total Phosphorus	Beryllium (Be)	Bromacil	Heptachlor
Orthophosphate	Boron (B)	Bromoxynil	Heptachlor-Epoxide
Total Suspended Solids	Cadmium (Cd)	Chlorpyrifos	Lindane
Calcium	Chromium (Cr)	Clopyralid	Methoxychlor
Magnesium	Cobalt (Co)	Dicamba	
Sodium	Copper (Cu)	Dichlorprop (2,4-DP)	
Potassium	Iron (Fe)	Diclofop	
Chloride	Lead (Pb)	Fenoxaprop	
Sulfate	Lithium (Li)	Imazethapyr	
Alkalinity (HCO_3, OH, CO_3)	Manganese (Mn)	MCPA	
Temperature	Mercury (Hg)	Mecoprop	
pH	Molybdenum (Mo)	Picloram	
EC	Nickel (Ni)	Quinclorac	
	Selenium (Se)	Triallate	
	Silver (Ag)		
	Strontium (Sr)		
	Tellurium (Te)		
Bacteria	Thallium (Tl)		
Total coliforms	Titanium (Ti)		
Fecal coliforms	Uranium (U)		
	Vanadium (V)		
	Zinc (Zn)		

Table 3. Summary of 2007– 2009 Water Quality Analyses for all sites – Range in measured parameter analytical values, frequency of detection and number of samples exceeding Irrigation Guideline

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Freguency (%)	# Samples Exceeding Irrigation Guideline
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	170	0.00-2.02	26	---
Nitrate-N (NO_3-N)	mg L^{-1}	---	170	0.0-4.4	11	---
Nitrite-N (NO_2-N)	mg L^{-1}	---	170	0.00-0.37	4	---
Total Kjeldahl N	mg L^{-1}	---	170	0.3-5.9	100	---
Total P	mg L^{-1}	---	170	0.0-0.8	14	---
Orthophosphate (PO_4-P)	mg L^{-1}	---	170	0.00-0.25	22	---
Calcium (Ca)	mg L^{-1}	---	170	17-61	100	---
Magnesium (Mg)	mg L^{-1}	---	170	14.4-50.0	100	---
Sodium (Na)	mg L^{-1}	---	170	17-172	100	---
Potassium (K)	mg L^{-1}	---	170	2.1-20.0	100	---
Chloride (Cl)	mg L^{-1}	100-700[5]	170	6-82	100	0
Sulfate (SO_4)	mg L^{-1}	---	170	48-283	100	---
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	170	104-197	100	---
Bicarbonate (HCO_3)	mg L^{-1}	---	170	0-237	99	---
Hydroxide (OH)	mg L^{-1}	---	170	0-28	1	---
Carbonate (CO_3)	mg L^{-1}	---	170	0-74	18	---
pH	pH	---	170	7.3-9.8	100	---
Electrical Conductivity	uS cm^{-1}	---	170	369-980	100	---
Temperature (at sampling)	^{0}C	---	170	12.0-29.0	100	---
Total Suspended Solids	mg L^{-1}	–	170	0-191	19	---
TDS (calculated)[1]	mg L^{-1}	500-3500[5]	170	169-653	100	22
Hardness (as $CaCO_3$)[2]	mg L^{-1}	---	170	122-340	100	---
SAR[3]	---	---	170	0.6-4.4	---	---
Bacteria						
Total Coliforms	MPN/100mL	1000	170	0-23000	86	4
Fecal Coliforms	MPN/100mL	100	170	0-430	75	11

[1] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[2] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[3] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[4] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[5] Crop specific (refer to CCME guidelines)

Table3 (continued)						
Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Freguency (%)	# Samples Exceeding Irrigation Guideline
Metals						
Aluminum (Al)	mg L^{-1}	5.0	170	0.00-6.10	64	1
Antimony (Sb)	mg L^{-1}	—	170	0.0000-0.0020	98	—
Arsenic (As)	mg L^{-1}	0.1	170	0.0006-0.0058	100	0
Barium (Ba)	mg L^{-1}	---	170	0.0436-0.1210	100	---
Beryllium (Be)	mg L^{-1}	0.1	170	---	0	0
Bismuth (Bi)	mg L^{-1}	—	170	0.0000-0.0002	1	---
Boron (B)	mg L^{-1}	0.5-6.0[5]	170	0.00-0.16	98	0
Cadmium (Cd)	mg L^{-1}	0.005	170	0.0000-0.0005	6	0
Chromium (Cr)	mg L^{-1}	0.005-0.008	170	0.0000-0.0098	30	1
Cobalt (Co)	mg L^{-1}	0.05	170	0.0000-0.0019	30	0
Copper (Cu)	mg L^{-1}	0.2-1.0[5]	170	0.000-0.010	79	0
Iron (Fe)	mg L^{-1}	5.0	170	0.000-323.000	99	1
Lead (Pb)	mg L^{-1}	0.2	170	0.0000-0.0025	45	0
Lithium (Li)	mg L^{-1}	2.5	170	0.000-0.076	99	0
Manganese (Mn)	mg L^{-1}	0.2	170	0.002-4.670	100	4
Mercury (Hg)	mg L^{-1}	---	170	0.0000-0.0003	1	---
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	170	0.0003-0.0191	100	0
Nickel (Ni)	mg L^{-1}	0.2	170	0.0001-0.0105	100	0
Selenium (Se)	mg L^{-1}	0.02-0.05	170	0.0000-0.0080	72	0
Sliver (Ag)	mg L^{-1}	---	170	---	0	—
Strontium (Sr)	mg L^{-1}	---	170	0.156-0.521	100	—
Tellurium (Te)	mg L^{-1}	---	170	---	0	—
Thallium (Tl)	mg L^{-1}	---	170	0.0000-0.0003	2	—
Tin (Sn)	mg L^{-1}	---	170	0.0000-0.0023	7	—
Titanium (Ti)	mg L^{-1}	—	170	0.000-0.184	18	—
Uranium (U)	mg L^{-1}	0.01	170	0.0002-0.0047	100	0
Vanadium (V)	mg L^{-1}	0.1	170	0.0000-0.0398	81	0
Zinc (Zn)	mg L^{-1}	1.0-5.0	170	0.000-0.080	51	0

Table3 (continued)

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Freguency (%)	# Samples Exceeding Irrigation Guideline
Herbicides						
2,4-D	ug L^{-1}	---	171	0.000-13.464	96	---
2,4-DB	ug L^{-1}	---	171	---	0	---
Atrazine	ug L^{-1}	10	171	---	0	0
Bromacil	ug L^{-1}	0.2	171	---	0	0
Bromoxynil	ug L^{-1}	0.33	171	0.000-0.093	3	0
Clopyralid	ug L^{-1}	---	171	---	0	---
Dicamba	ug L^{-1}	0.006	171	0.000-0.411	6	10
Diclofop-methyl	ug L^{-1}	0.18	171	---	0	0
Dichlorprop	ug L^{-1}	---	171	0.000-0.143	16	---
Ethalfluralin	ug L^{-1}	---	171	---	0	---
Fenoxaprop	ug L^{-1}	---	171	---	0	---
Imazethapyr	ug L^{-1}	---	171	---	0	---
MCPA	ug L^{-1}	0.025	171	0.000-0.200	26	39
Mecoprop	ug L^{-1}	---	171	0.000-0.475	2	---
Picloram	ug L^{-1}	---	171	---	0	---
Quinclorac	ug L^{-1}	---	171	---	0	---
Trifluralin	ug L^{-1}	---	171	---	0	---
Triallate	ug L^{-1}	--	171	---	0	---
Insecticides						
Aldrin	ug L^{-1}	---	171	---	0	---
Chlorpyrifos	ug L^{-1}	---	171	---	0	---
"op" DDE	ug L^{-1}	---	171	---	0	---
"pp" DDE	ug L^{-1}	---	171	---	0	---
Dieldrin	ug L^{-1}	---	171	---	0	---
Dimethoate	ug L^{-1}	---	171	---	0	---
Heptachlor	ug L^{-1}	---	171	---	0	---
Heptachlor-Epoxide	ug L^{-1}	---	171	---	0	---
Lindane	ug L^{-1}	---	171	---	0	---
Methoxychlor	ug L^{-1}	---	171	---	0	---

Table 4. Summary of 2007– 2009 Water Quality Analyses for the LDDA Sampling Area – Range in measured parameter analytical values, frequency of detection and number of samples exceeding Irrigation Guideline

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Frequency (%)	# Samples Exceeding Irrigation Guideline
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	107	0.00-0.16	22	---
Nitrate-N (NO_3-N)	mg L^{-1}	---	107	0.0-0.5	8	---
Nitrite-N (NO_2-N)	mg L^{-1}	---	107	0.00-0.09	2	---
Total Kjeldahl N	mg L^{-1}	---	107	0.3-1.4	100	---
Total P	mg L^{-1}	---	107	0.0-0.3	7	---
Orthophosphate (PO_4-P)	mg L^{-1}	---	107	0.00-0.15	14	---
Calcium (Ca)	mg L^{-1}	---	107	21-57	100	---
Magnesium (Mg)	mg L^{-1}	---	107	14.4-35.0	100	---
Sodium (Na)	mg L^{-1}	---	107	17-172	100	---
Potassium (K)	mg L^{-1}	---	107	2.1-14.0	100	---
Chloride (Cl)	mg L^{-1}	100-700[5]	107	6-14	100	0
Sulfate (SO_4)	mg L^{-1}	---	107	48-172	100	---
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	107	115-189	100	---
Bicarbonate (HCO_3)	mg L^{-1}	---	107	0-230	99	---
Hydroxide (OH)	mg L^{-1}	---	107	0-28	1	---
Carbonate (CO_3)	mg L^{-1}	---	107	0-48	7	---
pH	pH	---	107	8.1-9.8	100	---
Electrical Conductivity	uS cm^{-1}	---	107	380-788	100	---
Temperature (at sampling)	^{0}C	---	107	12.0-29.0	100	---
Total Suspended Solids	mg L^{-1}	--	107	0-191	6	---
TDS (calculated)[1]	mg L^{-1}	500-3500[5]	107	169-453	100	0
Hardness (as $CaCO_3$)[2]	mg L^{-1}	---	107	137-282	100	---
SAR[3]	---	---	107	0.6-4.4	---	---
Bacteria						
Total Coliforms	MPN/100mL	1000	107	0-1500	85	1
Fecal Coliforms	MPN/100mL	100	107	0-230	75	4

[1] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[2] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[3] Sodium Adsorption Ratio = Na^{+} (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[4] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[5] Crop specific (refer to CCME guidelines)

Table 4 (continued)

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Frequency (%)	# Samples Exceeding Irrigation Guideline
Metals						
Aluminum (Al)	mg L^{-1}	5.0	107	0.00-2.36	58	0
Antimony (Sb)	mg L^{-1}	---	107	0.0000-0.0020	97	---
Arsenic (As)	mg L^{-1}	0.1	107	0.0006-0.0031	100	0
Barium (Ba)	mg L^{-1}	---	107	0.0460-0.1210	100	---
Beryllium (Be)	mg L^{-1}	0.1	107	---	0	0
Bismuth (Bi)	mg L^{-1}	---	107	0.0000-0.0002	1	---
Boron (B)	mg L^{-1}	0.5-6.0[5]	107	0.00-0.05	97	0
Cadmium (Cd)	mg L^{-1}	0.005	107	0.0000-0.0005	9	0
Chromium (Cr)	mg L^{-1}	0.005-0.008	107	0.0000-0.0045	15	0
Cobalt (Co)	mg L^{-1}	0.05	107	0.0000-0.0019	14	0
Copper (Cu)	mg L^{-1}	0.2-1.0[5]	107	0.000-0.006	81	0
Iron (Fe)	mg L^{-1}	5.0	107	0.000-323.00	99	1
Lead (Pb)	mg L^{-1}	0.2	107	0.0000-0.0020	33	0
Lithium (Li)	mg L^{-1}	2.5	107	0.000-0.051	99	0
Manganese (Mn)	mg L^{-1}	0.2	107	0.002-4.670	100	1
Mercury (Hg)	mg L^{-1}	---	107	0.0000-0.0003	2	---
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	107	0.0010-0.0036	100	0
Nickel (Ni)	mg L^{-1}	0.2	107	0.0001-0.0085	100	0
Selenium (Se)	mg L^{-1}	0.02-0.05	107	0.0000-0.0080	70	0
Sliver (Ag)	mg L^{-1}	---	107	---	0	---
Strontium (Sr)	mg L^{-1}	---	107	0.205-0.371	100	---
Tellurium (Te)	mg L^{-1}	---	107	---	0	---
Thallium (Tl)	mg L^{-1}	---	107	0.0000-0.0003	2	---
Tin (Sn)	mg L^{-1}	---	107	0.0000-0.0023	10	---
Titanium (Ti)	mg L^{-1}	---	107	0.000-0.080	9	---
Uranium (U)	mg L^{-1}	0.01	107	0.0007-0.0047	100	0
Vanadium (V)	mg L^{-1}	0.1	107	0.0000-0.0280	78	0
Zinc (Zn)	mg L^{-1}	1.0-5.0	107	0.000-0.080	46	0

Table 4 (continued)

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Frequency (%)	# Samples Exceeding Irrigation Guideline
Herbicides						
2,4-D	ug L^{-1}	---	108	0.025-13.464	100	---
2,4-DB	ug L^{-1}	---	108	---	0	---
Atrazine	ug L^{-1}	10	108	---	0	0
Bromacil	ug L^{-1}	0.2	108	---	0	0
Bromoxynil	ug L^{-1}	0.33	108	0.000-0.025	2	0
Clopyralid	ug L^{-1}	---	108	---	0	---
Dicamba	ug L^{-1}	0.006	108	---	0	0
Diclofop-methyl	ug L^{-1}	0.18	108	---	0	0
Dichlorprop	ug L^{-1}	---	108	0.000-0.074	13	---
Ethalfluralin	ug L^{-1}	---	108	---	0	---
Fenoxaprop	ug L^{-1}	---	108	---	0	---
Imazethapyr	ug L^{-1}	---	108	---	0	---
MCPA	ug L^{-1}	0.025	108	0.000-0.177	20	20
Mecoprop	ug L^{-1}	---	108	---	0	---
Picloram	ug L^{-1}	---	108	---	0	---
Quinclorac	ug L^{-1}	---	108	---	0	---
Trifluralin	ug L^{-1}	---	108	---	0	---
Triallate	ug L^{-1}	--	108	---	0	---
Insecticides						
Aldrin	ug L^{-1}	---	108	---	0	---
Chlorpyrifos	ug L^{-1}	---	108	---	0	---
"op" DDE	ug L^{-1}	---	108	---	0	---
"pp" DDE	ug L^{-1}	---	108	---	0	---
Dieldrin	ug L^{-1}	---	108	---	0	---
Dimethoate	ug L^{-1}	---	108	---	0	---
Heptachlor	ug L^{-1}	---	108	---	0	---
Heptachlor-Epoxide	ug L^{-1}	---	108	---	0	---
Lindane	ug L^{-1}	---	108	---	0	---
Methoxychlor	ug L^{-1}	---	108	---	0	---

Table 5. Summary of 2007– 2009 Water Quality Analyses for the Moon Lake Irrigation District Sampling Area – Range in measured parameter analytical values, frequency of detection and number of samples exceeding Irrigation Guideline

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Freguency (%)	# Samples Exceeding Irrigation Guideline
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	18	0.00-0.19	33	---
Nitrate-N (NO_3-N)	mg L^{-1}	---	18	---	0	---
Nitrite-N (NO_2-N)	mg L^{-1}	---	18	---	0	---
Total Kjeldahl N	mg L^{-1}	---	18	0.6-4.9	100	---
Total P	mg L^{-1}	---	18	0.0-0.6	6	---
Orthophosphate (PO_4-P)	mg L^{-1}	---	18	0.00-0.04	11	---
Calcium (Ca)	mg L^{-1}	---	18	17-51	100	---
Magnesium (Mg)	mg L^{-1}	---	18	18.6-50.0	100	---
Sodium (Na)	mg L^{-1}	---	18	25-102	100	---
Potassium (K)	mg L^{-1}	---	18	2.7-20.0	100	---
Chloride (Cl)	mg L^{-1}	100-700[5]	18	82-100	100	0
Sulfate (SO_4)	mg L^{-1}	---	18	63-255	100	---
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	18	104-168	100	---
Bicarbonate (HCO_3)	mg L^{-1}	---	18	53-205	100	---
Hydroxide (OH)	mg L^{-1}	---	18	---	0	---
Carbonate (CO_3)	mg L^{-1}	---	18	0-47	22	---
pH	pH	---	18	7.3-9.4	100	---
Electrical Conductivity	uS cm^{-1}	---	18	369-980	100	---
Temperature (at sampling)	^0C	---	18	18.5-26.1	100	---
Total Suspended Solids	mg L^{-1}	--	18	0-30	11	---
TDS (calculated)[1]	mg L^{-1}	500-3500[5]	18	204-653	100	3
Hardness (as $CaCO_3$)[2]	mg L^{-1}	---	18	122-321	100	---
SAR[3]	---	---	18	0.9-2.5	---	---
Bacteria						
Total Coliforms	MPN/100mL	1000	18	3-9300	100	1
Fecal Coliforms	MPN/100mL	100	18	1-230	94	2

[1] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[2] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[3] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[4] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[5] Crop specific (refer to CCME guidelines)

Table 5 (continued)

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Frequency (%)	# Samples Exceeding Irrigation Guideline
Metals						
Aluminum (Al)	mg L^{-1}	5.0	18	0.00-0.07	44	0
Antimony (Sb)	mg L^{-1}	---	18	0.0000-0.0017	94	---
Arsenic (As)	mg L^{-1}	0.1	18	0.0009-0.0029	100	0
Barium (Ba)	mg L^{-1}	---	18	0.0446-0.1160	100	---
Beryllium (Be)	mg L^{-1}	0.1	18	---	0	0
Bismuth (Bi)	mg L^{-1}	---	18	---	0	---
Boron (B)	mg L^{-1}	0.5-6.0[5]	18	0.03-0.09	100	0
Cadmium (Cd)	mg L^{-1}	0.005	18	---	0	0
Chromium (Cr)	mg L^{-1}	0.005-0.008	18	0.0000-0.0041	44	0
Cobalt (Co)	mg L^{-1}	0.05	18	0.0000-0.0003	22	0
Copper (Cu)	mg L^{-1}	0.2-1.0[5]	18	0.000-0.010	22	0
Iron (Fe)	mg L^{-1}	5.0	18	0.025-0.486	100	0
Lead (Pb)	mg L^{-1}	0.2	18	0.0000-0.0015	67	0
Lithium (Li)	mg L^{-1}	2.5	18	0.011-0.074	100	0
Manganese (Mn)	mg L^{-1}	0.2	18	0.006-0.069	100	0
Mercury (Hg)	mg L^{-1}	---	18	---	0	---
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	18	0.0003-0.0011	100	0
Nickel (Ni)	mg L^{-1}	0.2	18	0.0009-0.0021	100	0
Selenium (Se)	mg L^{-1}	0.02-0.05	18	0.0000-0.0014	67	0
Sliver (Ag)	mg L^{-1}	---	18	---	0	---
Strontium (Sr)	mg L^{-1}	---	18	0.156-0.450	100	---
Tellurium (Te)	mg L^{-1}	---	18	---	0	---
Thallium (Tl)	mg L^{-1}	---	18	---	0	---
Tin (Sn)	mg L^{-1}	---	18	---	0	---
Titanium (Ti)	mg L^{-1}	---	18	0.000-0.006	6	---
Uranium (U)	mg L^{-1}	0.01	18	0.0002-0.0010	100	0
Vanadium (V)	mg L^{-1}	0.1	18	0.0000-0.0015	61	0
Zinc (Zn)	mg L^{-1}	1.0-5.0	18	0.000-0.009	39	0

Table 5 (continued)

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Freguency (%)	# Samples Exceeding Irrigation Guideline
Herbicides						
2,4-D	ug L^{-1}	---	18	0.000-0.434	89	---
2,4-DB	ug L^{-1}	---	18	---	0	---
Atrazine	ug L^{-1}	10	18	---	0	0
Bromacil	ug L^{-1}	0.2	18	---	0	0
Bromoxynil	ug L^{-1}	0.33	18	0.000-0.021	11	0
Clopyralid	ug L^{-1}	---	18	---	0	---
Dicamba	ug L^{-1}	0.006	18	0.000-0.063	11	2
Diclofop-methyl	ug L^{-1}	0.18	18	---	0	0
Dichlorprop	ug L^{-1}	---	18	0.000-0.044	17	---
Ethalfluralin	ug L^{-1}	---	18	---	0	---
Fenoxaprop	ug L^{-1}	---	18	---	0	---
Imazethapyr	ug L^{-1}	---	18	---	0	---
MCPA	ug L^{-1}	0.025	18	0.000-0.107	50	7
Mecoprop	ug L^{-1}	---	18	---	0	---
Picloram	ug L^{-1}	---	18	---	0	---
Quinclorac	ug L^{-1}	---	18	---	0	---
Trifluralin	ug L^{-1}	---	18	---	0	---
Triallate	ug L^{-1}	--	18	---	0	---
Insecticides						
Aldrin	ug L^{-1}	---	18	---	0	---
Chlorpyrifos	ug L^{-1}	---	18	---	0	---
"op" DDE	ug L^{-1}	---	18	---	0	---
"pp" DDE	ug L^{-1}	---	18	---	0	---
Dieldrin	ug L^{-1}	---	18	---	0	---
Dimethoate	ug L^{-1}	---	18	---	0	---
Heptachlor	ug L^{-1}	---	18	---	0	---
Heptachlor-Epoxide	ug L^{-1}	---	18	---	0	---
Lindane	ug L^{-1}	---	18	---	0	---
Methoxychlor	ug L^{-1}	---	18	---	0	---

Table 6. Summary of 2007– 2009 Water Quality Analyses for the SSEWS Sampling Area – Range in measured parameter analytical values, frequency of detection and number of samples exceeding Irrigation Guideline

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Frequency (%)	# Samples Exceeding Irrigation Guideline
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	27	0.00-1.36	30	---
Nitrate-N (NO_3-N)	mg L^{-1}	---	27	---	0	---
Nitrite-N (NO_2-N)	mg L^{-1}	---	27	---	0	---
Total Kjeldahl N	mg L^{-1}	---	27	0.5-5.9	100	---
Total P	mg L^{-1}	---	27	0.0-0.8	30	---
Orthophosphate (PO_4-P)	mg L^{-1}	---	27	0.00-0.25	30	---
Calcium (Ca)	mg L^{-1}	---	27	30-60	100	---
Magnesium (Mg)	mg L^{-1}	---	27	18.2-47.1	100	---
Sodium (Na)	mg L^{-1}	---	27	26-75	100	---
Potassium (K)	mg L^{-1}	---	27	3.9-11.1	100	---
Chloride (Cl)	mg L^{-1}	100-700[5]	27	20-100	100	0
Sulfate (SO_4)	mg L^{-1}	---	27	75-283	100	---
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	27	124-197	100	---
Bicarbonate (HCO_3)	mg L^{-1}	---	27	37-237	100	---
Hydroxide (OH)	mg L^{-1}	---	27	---	0	---
Carbonate (CO_3)	mg L^{-1}	---	27	0-74	63	---
pH	pH	---	27	8.3-9.2	100	---
Electrical Conductivity	uS cm^{-1}	---	27	420-964	100	---
Temperature (at sampling)	^{0}C	---	27	16.0-26.5	100	---
Total Suspended Solids	mg L^{-1}	--	27	0-50	26	---
TDS (calculated)[1]	mg L^{-1}	500-3500[5]	27	258-608	100	16
Hardness (as $CaCO_3$)[2]	mg L^{-1}	---	27	159-340	100	---
SAR[3]	---	---	27	0.9-1.9	---	---
Bacteria						
Total Coliforms	MPN/100mL	1000	27	0-1500	89	1
Fecal Coliforms	MPN/100mL	100	27	0-430	52	2

[1] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[2] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[3] Sodium Adsorption Ratio = $Na^+ (\text{meq L}^{-1})/[[Ca^{++} (\text{meq L}^{-1}) + Mg^{++} (\text{meq L}^{-1})]/2]^{1/2}$

[4] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[5] Crop specific (refer to CCME guidelines)

Table 6 (continued)

Parameter	Units	Irrigation Guideline^4	# Samples	Analysis Range	Detection Freguency (%)	# Samples Exceeding Irrigation Guideline
Metals						
Aluminum (Al)	mg L^{-1}	5.0	27	0.00-0.48	74	0
Antimony (Sb)	mg L^{-1}	---	27	0.0005-0.0015	100	---
Arsenic (As)	mg L^{-1}	0.1	27	0.0016-0.0056	100	0
Barium (Ba)	mg L^{-1}	---	27	0.0436-0.1110	100	---
Beryllium (Be)	mg L^{-1}	0.1	27	---	0	0
Bismuth (Bi)	mg L^{-1}	---	27	---	0	---
Boron (B)	mg L^{-1}	0.5-6.0^5	27	0.03-0.14	100	0
Cadmium (Cd)	mg L^{-1}	0.005	27	---	0	0
Chromium (Cr)	mg L^{-1}	0.005-0.008	27	0.0000-0.0014	33	0
Cobalt (Co)	mg L^{-1}	0.05	27	0.0000-0.0005	52	0
Copper (Cu)	mg L^{-1}	0.2-1.0^5	27	0.000-0.002	93	0
Iron (Fe)	mg L^{-1}	5.0	27	0.028-0.493	100	0
Lead (Pb)	mg L^{-1}	0.2	27	0.0000-0.0018	41	0
Lithium (Li)	mg L^{-1}	2.5	27	0.012-0.076	100	0
Manganese (Mn)	mg L^{-1}	0.2	27	0.009-0.282	100	0
Mercury (Hg)	mg L^{-1}	---	27	---	0	---
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	27	0.0013-0.0029	100	0
Nickel (Ni)	mg L^{-1}	0.2	27	0.0013-0.0032	100	0
Selenium (Se)	mg L^{-1}	0.02-0.05	27	0.0000-0.0020	74	0
Sliver (Ag)	mg L^{-1}	---	27	---	0	---
Strontium (Sr)	mg L^{-1}	---	27	0.204-0.521	100	---
Tellurium (Te)	mg L^{-1}	---	27	---	0	---
Thallium (Tl)	mg L^{-1}	---	27	---	0	---
Tin (Sn)	mg L^{-1}	---	27	0.0000-0.0004	4	---
Titanium (Ti)	mg L^{-1}	---	27	0.000-0.012	7	---
Uranium (U)	mg L^{-1}	0.01	27	0.0009-0.0022	100	0
Vanadium (V)	mg L^{-1}	0.1	27	0.0000-0.0026	96	0
Zinc (Zn)	mg L^{-1}	1.0-5.0	27	0.000-0.016	44	0

Table 6 (continued)						
Parameter	**Units**	**Irrigation Guideline[4]**	**# Samples**	**Analysis Range**	**Detection Frequency (%)**	**# Samples Exceeding Irrigation Guideline**
Herbicides						
2,4-D	ug L^{-1}	---	27	0.000-0.349	89	---
2,4-DB	ug L^{-1}	---	27	---	0	---
Atrazine	ug L^{-1}	10	27	---	0	0
Bromacil	ug L^{-1}	0.2	27	---	0	0
Bromoxynil	ug L^{-1}	0.33	27	---	0	0
Clopyralid	ug L^{-1}	---	27	---	0	---
Dicamba	ug L^{-1}	0.006	27	0.000-0.067	7	2
Diclofop-methyl	ug L^{-1}	0.18	27	---	0	0
Dichlorprop	ug L^{-1}	---	27	0.000-0.029	15	---
Ethalfluralin	ug L^{-1}	---	27	---	0	---
Fenoxaprop	ug L^{-1}	---	27	---	0	---
Imazethapyr	ug L^{-1}	---	27	---	0	---
MCPA	ug L^{-1}	0.025	27	0.000-0.200	41	9
Mecoprop	ug L^{-1}	---	27	---	0	---
Picloram	ug L^{-1}	---	27	---	0	---
Quinclorac	ug L^{-1}	---	27	---	0	---
Trifluralin	ug L^{-1}	---	27	---	0	---
Triallate	ug L^{-1}	–	27	---	0	---
Insecticides						
Aldrin	ug L^{-1}	---	27	---	0	---
Chlorpyrifos	ug L^{-1}	---	27	---	0	---
"op" DDE	ug L^{-1}	---	27	---	0	---
"pp" DDE	ug L^{-1}	---	27	---	0	---
Dieldrin	ug L^{-1}	---	27	---	0	---
Dimethoate	ug L^{-1}	---	27	---	0	---
Heptachlor	ug L^{-1}	---	27	---	0	---
Heptachlor-Epoxide	ug L^{-1}	---	27	---	0	---
Lindane	ug L^{-1}	---	27	---	0	---
Methoxychlor	ug L^{-1}	---	27	---	0	---

Table 7. Summary of 2007– 2009 Water Quality Analyses for the Lumsden Valley Sampling Area – Range in measured parameter analytical values, frequency of detection and number of samples exceeding Irrigation Guideline

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Frequency (%)	# Samples Exceeding Irrigation Guideline
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	—	18	0.00-2.02	33	—
Nitrate-N (NO_3-N)	mg L^{-1}	—	18	0.0-4.4	50	—
Nitrite-N (NO_2-N)	mg L^{-1}	—	18	0.00-0.37	22	—
Total Kjeldahl N	mg L^{-1}	—	18	0.4-4.2	100	—
Total P	mg L^{-1}	—	18	0.0-0.4	44	—
Orthophosphate (PO_4-P)	mg L^{-1}	—	18	0.00-0.17	67	—
Calcium (Ca)	mg L^{-1}	—	18	26-61	100	—
Magnesium (Mg)	mg L^{-1}	—	18	18.2-31.0	100	—
Sodium (Na)	mg L^{-1}	—	18	36-106	100	—
Potassium (K)	mg L^{-1}	—	18	3.9-10.0	100	—
Chloride (Cl)	mg L^{-1}	100-700[5]	18	13-77	100	0
Sulfate (SO_4)	mg L^{-1}	—	18	86-211	100	—
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	—	18	120-170	100	—
Bicarbonate (HCO_3)	mg L^{-1}	—	18	17-207	100	—
Hydroxide (OH)	mg L^{-1}	—	18	—	0	—
Carbonate (CO_3)	mg L^{-1}	—	18	0-17	6	—
pH	pH	—	18	7.9-8.9	100	—
Electrical Conductivity	uS cm^{-1}	—	18	442-870	100	—
Temperature (at sampling)	^{0}C	—	18	16.0-27.0	100	—
Total Suspended Solids	mg L^{-1}	–	18	10-120	100	—
TDS (calculated)[1]	mg L^{-1}	500-3500[5]	18	260-610	100	3
Hardness (as $CaCO_3$)[2]	mg L^{-1}	—	18	139-280	100	—
SAR[3]	—	—	18	1.3-2.7	—	—
Bacteria						
Total Coliforms	MPN/100mL	1000	18	37-23000	78	1
Fecal Coliforms	MPN/100mL	100	18	9-430	89	3

[1] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[2] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[3] Sodium Adsorption Ratio = Na^{+} (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[4] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[5] Crop specific (refer to CCME guidelines)

Table 7 (continued)

Parameter	Units	Irrigation Guideline[4]	# Samples	Analysis Range	Detection Freguency (%)	# Samples Exceeding Irrigation Guideline
Metals						
Aluminum (Al)	mg L^{-1}	5.0	18	0.41-6.10	100	1
Antimony (Sb)	mg L^{-1}	---	18	0.0005-0.0013	100	---
Arsenic (As)	mg L^{-1}	0.1	18	0.0025-0.0058	100	0
Barium (Ba)	mg L^{-1}	---	18	0.0541-0.1130	100	---
Beryllium (Be)	mg L^{-1}	0.1	18	---	0	0
Bismuth (Bi)	mg L^{-1}	---	18	---	0	---
Boron (B)	mg L^{-1}	0.5-6.0[5]	18	0.05-0.16	100	0
Cadmium (Cd)	mg L^{-1}	0.005	18	---	0	0
Chromium (Cr)	mg L^{-1}	0.005-0.008	18	0.0012-0.0098	100	1
Cobalt (Co)	mg L^{-1}	0.05	18	0.0005-0.0019	100	0
Copper (Cu)	mg L^{-1}	0.2-1.0[5]	18	0.002-0.006	100	0
Iron (Fe)	mg L^{-1}	5.0	18	0.642-4.280	100	0
Lead (Pb)	mg L^{-1}	0.2	18	0.0006-0.0025	100	0
Lithium (Li)	mg L^{-1}	2.5	18	0.017-0.050	100	0
Manganese (Mn)	mg L^{-1}	0.2	18	0.052-0.240	100	2
Mercury (Hg)	mg L^{-1}	---	18	---	0	---
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	18	0.0016-0.0191	100	0
Nickel (Ni)	mg L^{-1}	0.2	18	0.0027-0.0105	100	0
Selenium (Se)	mg L^{-1}	0.02-0.05	18	0.0000-0.0029	89	0
Sliver (Ag)	mg L^{-1}	---	18	---	0	---
Strontium (Sr)	mg L^{-1}	---	18	0.191-0.345	100	---
Tellurium (Te)	mg L^{-1}	---	18	---	0	---
Thallium (Tl)	mg L^{-1}	---	18	0.0000-0.0001	6	---
Tin (Sn)	mg L^{-1}	---	18	---	0	---
Titanium (Ti)	mg L^{-1}	---	18	0.013-0.184	100	---
Uranium (U)	mg L^{-1}	0.01	18	0.0014-0.0022	100	0
Vanadium (V)	mg L^{-1}	0.1	18	0.0027-0.0398	100	0
Zinc (Zn)	mg L^{-1}	1.0-5.0	18	0.005-0.021	100	0

Table 7 (continued)						
Parameter	**Units**	**Irrigation Guideline[4]**	**# Samples**	**Analysis Range**	**Detection Freguency (%)**	**# Samples Exceeding Irrigation Guideline**
Herbicides						
2,4-D	ug L^{-1}	---	18	0.000-1.488	94	---
2,4-DB	ug L^{-1}	---	18	---	0	---
Atrazine	ug L^{-1}	10	18	---	0	0
Bromacil	ug L^{-1}	0.2	18	---	0	0
Bromoxynil	ug L^{-1}	0.33	18	0.000-0.093	6	0
Clopyralid	ug L^{-1}	---	18	---	0	---
Dicamba	ug L^{-1}	0.006	18	0.000-0.411	33	6
Diclofop-methyl	ug L^{-1}	0.18	18	---	0	0
Dichlorprop	ug L^{-1}	---	18	0.000-0.143	39	---
Ethalfluralin	ug L^{-1}	---	18	---	0	---
Fenoxaprop	ug L^{-1}	---	18	---	0	---
Imazethapyr	ug L^{-1}	---	18	---	0	---
MCPA	ug L^{-1}	0.025	18	0.000-0.190	17	3
Mecoprop	ug L^{-1}	---	18	0.000-0.475	22	---
Picloram	ug L^{-1}	---	18	---	0	---
Quinclorac	ug L^{-1}	---	18	---	0	---
Trifluralin	ug L^{-1}	---	18	---	0	---
Triallate	ug L^{-1}	--	18	---	0	---
Insecticides						
Aldrin	ug L^{-1}	---	18	---	0	---
Chlorpyrifos	ug L^{-1}	---	18	---	0	---
"op" DDE	ug L^{-1}	---	18	---	0	---
"pp" DDE	ug L^{-1}	---	18	---	0	---
Dieldrin	ug L^{-1}	---	18	---	0	---
Dimethoate	ug L^{-1}	---	18	---	0	---
Heptachlor	ug L^{-1}	---	18	---	0	---
Heptachlor-Epoxide	ug L^{-1}	---	18	---	0	---
Lindane	ug L^{-1}	---	18	---	0	---
Methoxychlor	ug L^{-1}	---	18	---	0	---

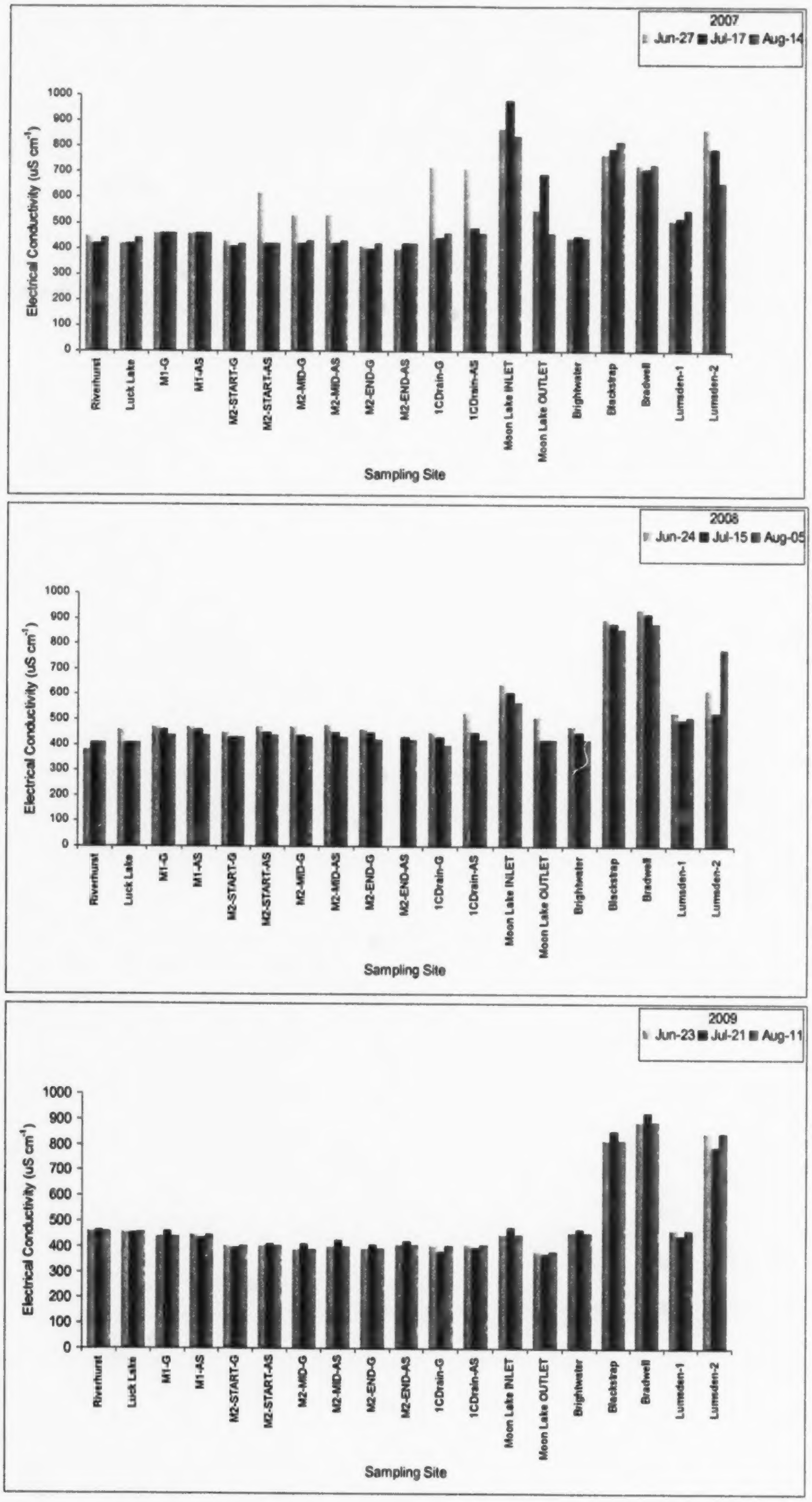


Figure 1. Electrical conductivity of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

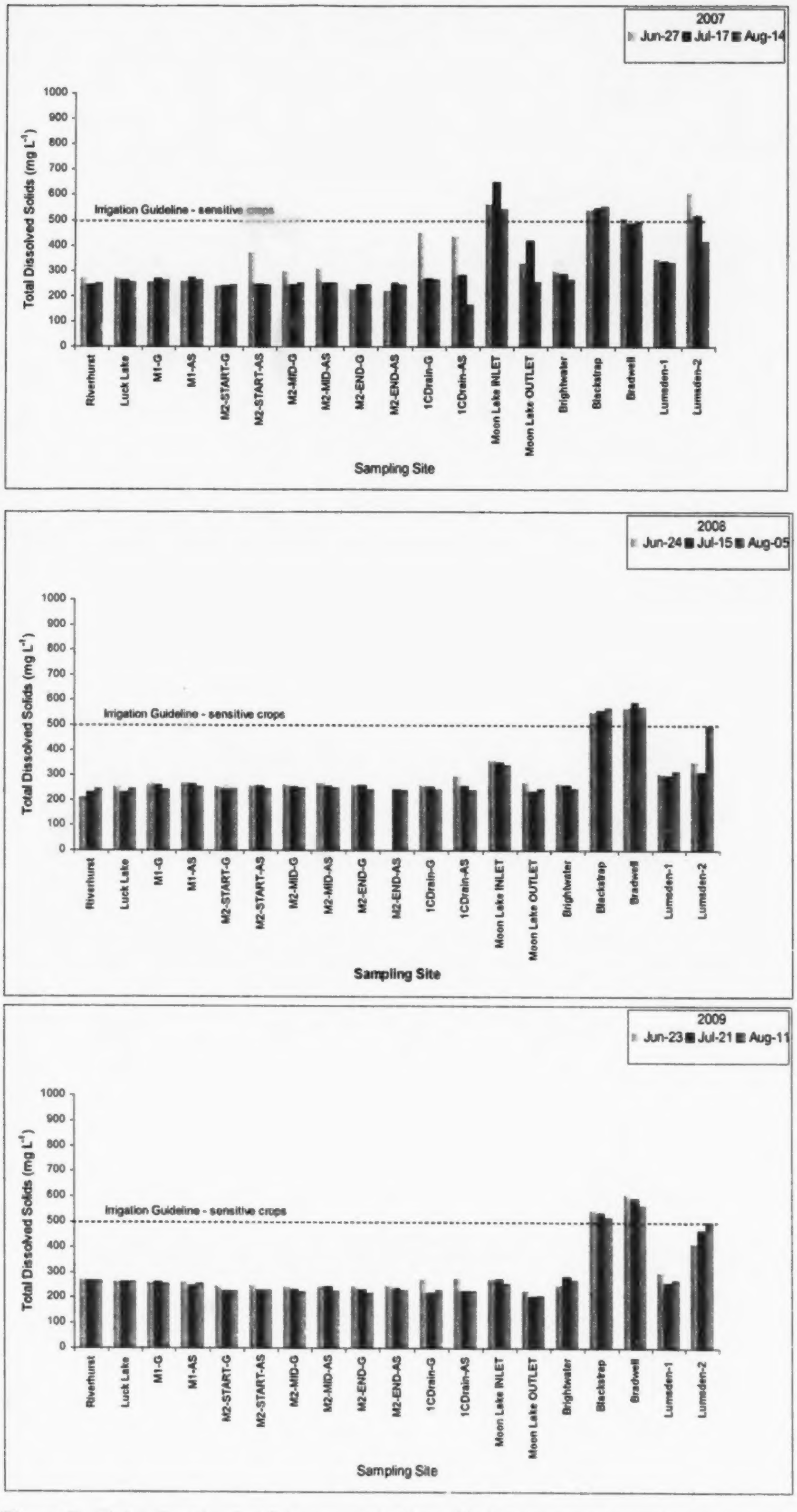


Figure 2. Total dissolved solids concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

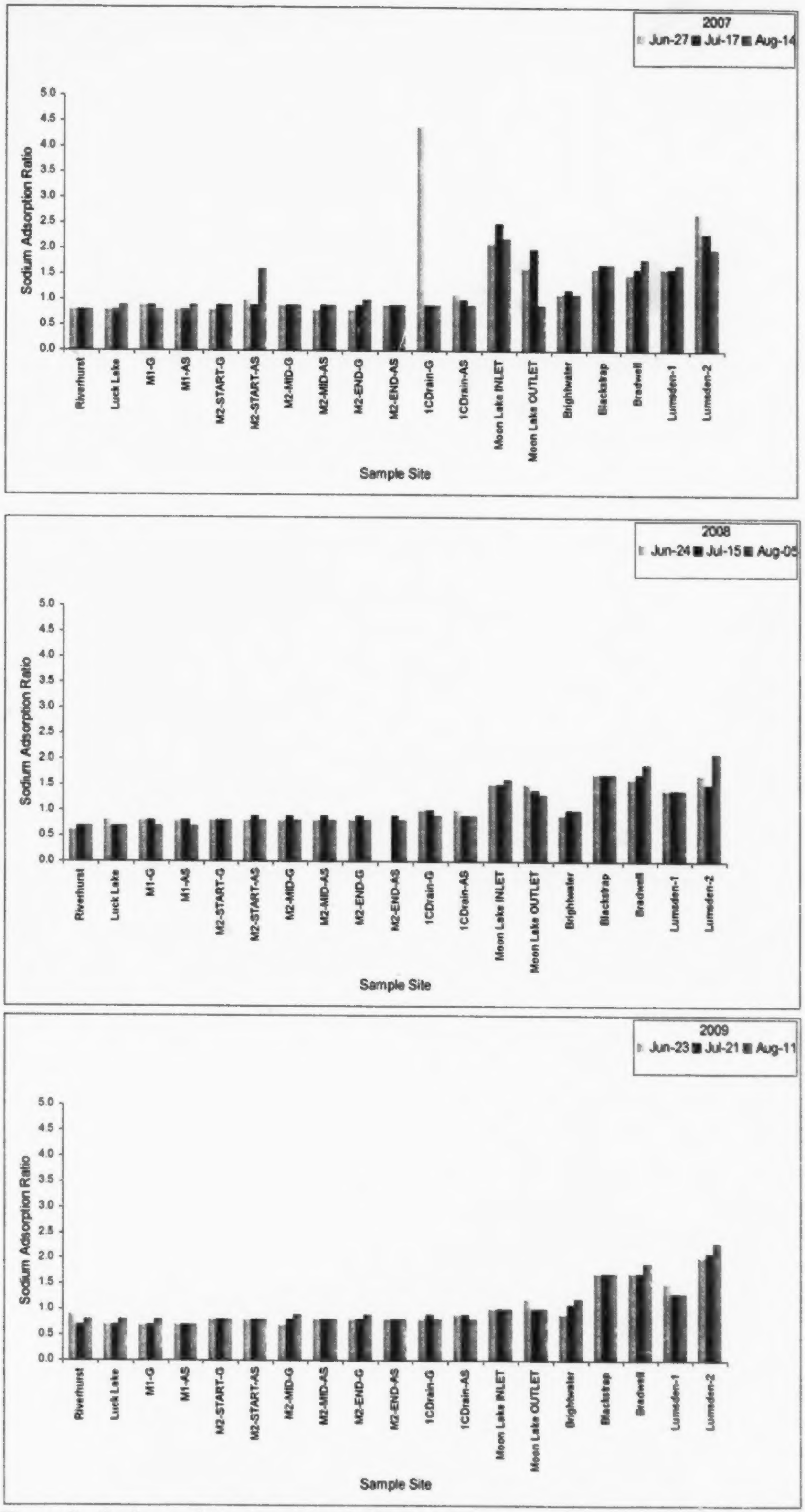


Figure 3. Sodium adsorption ratio of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

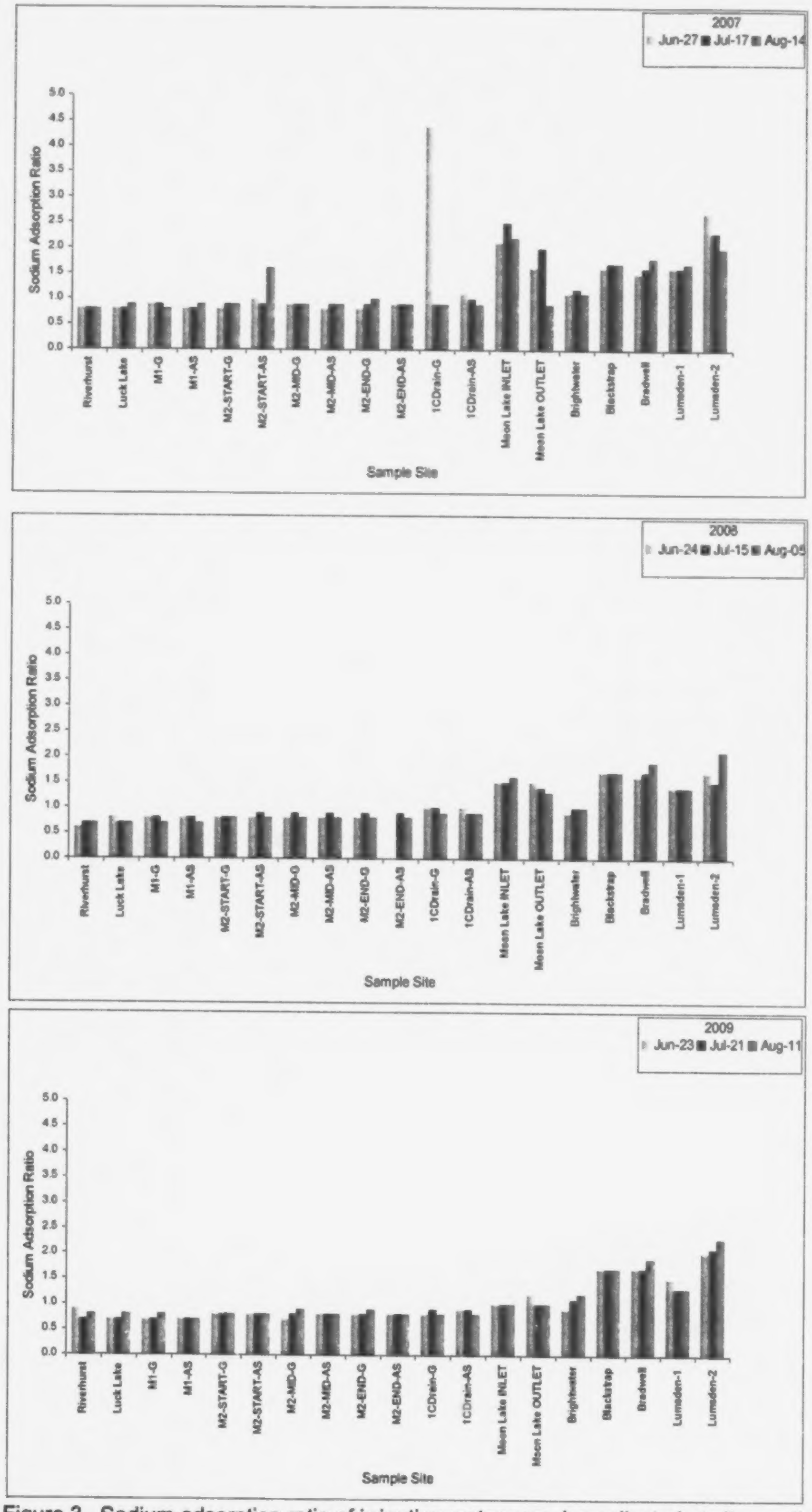


Figure 3. Sodium adsorption ratio of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

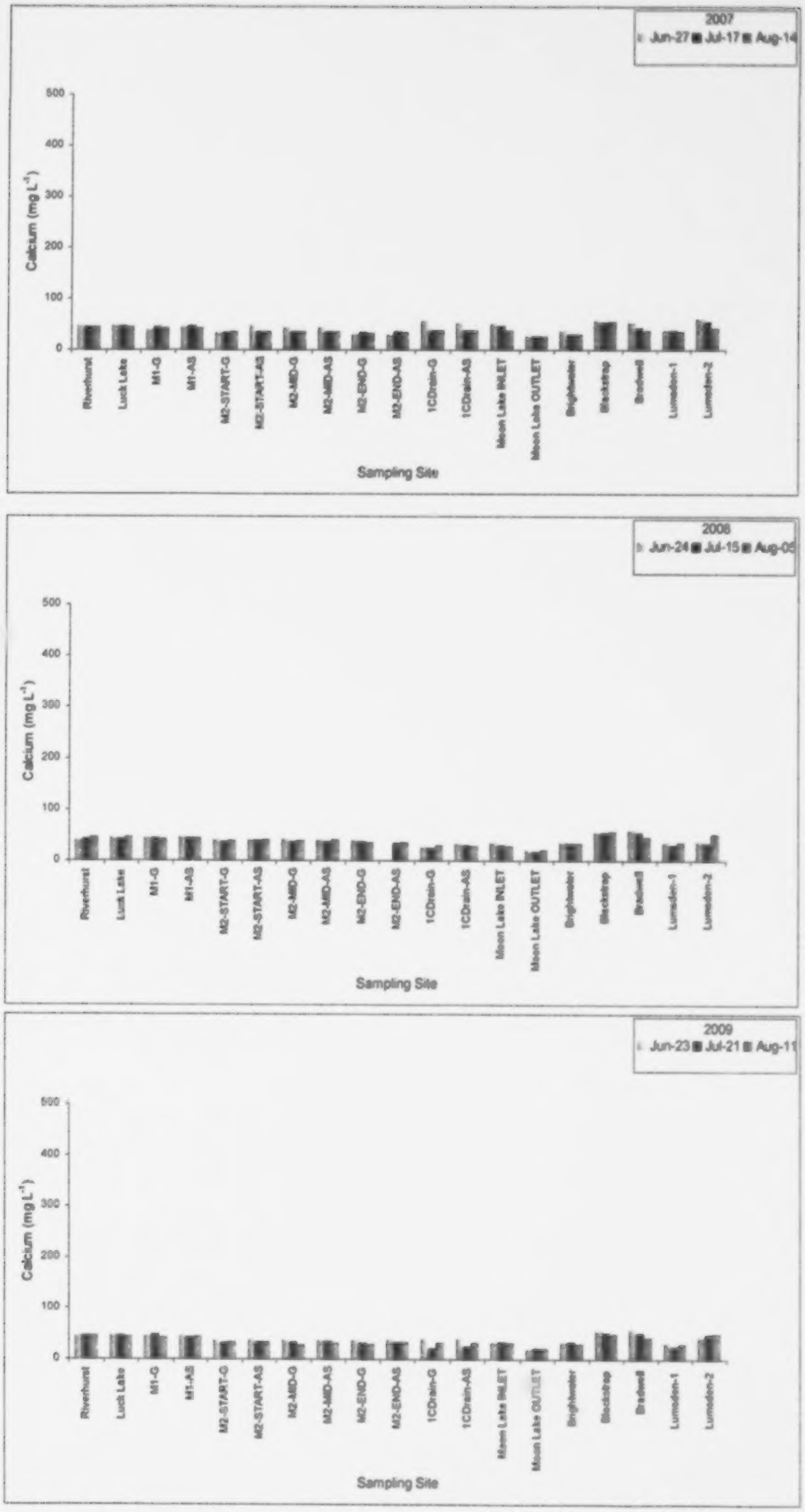


Figure 4. Calcium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

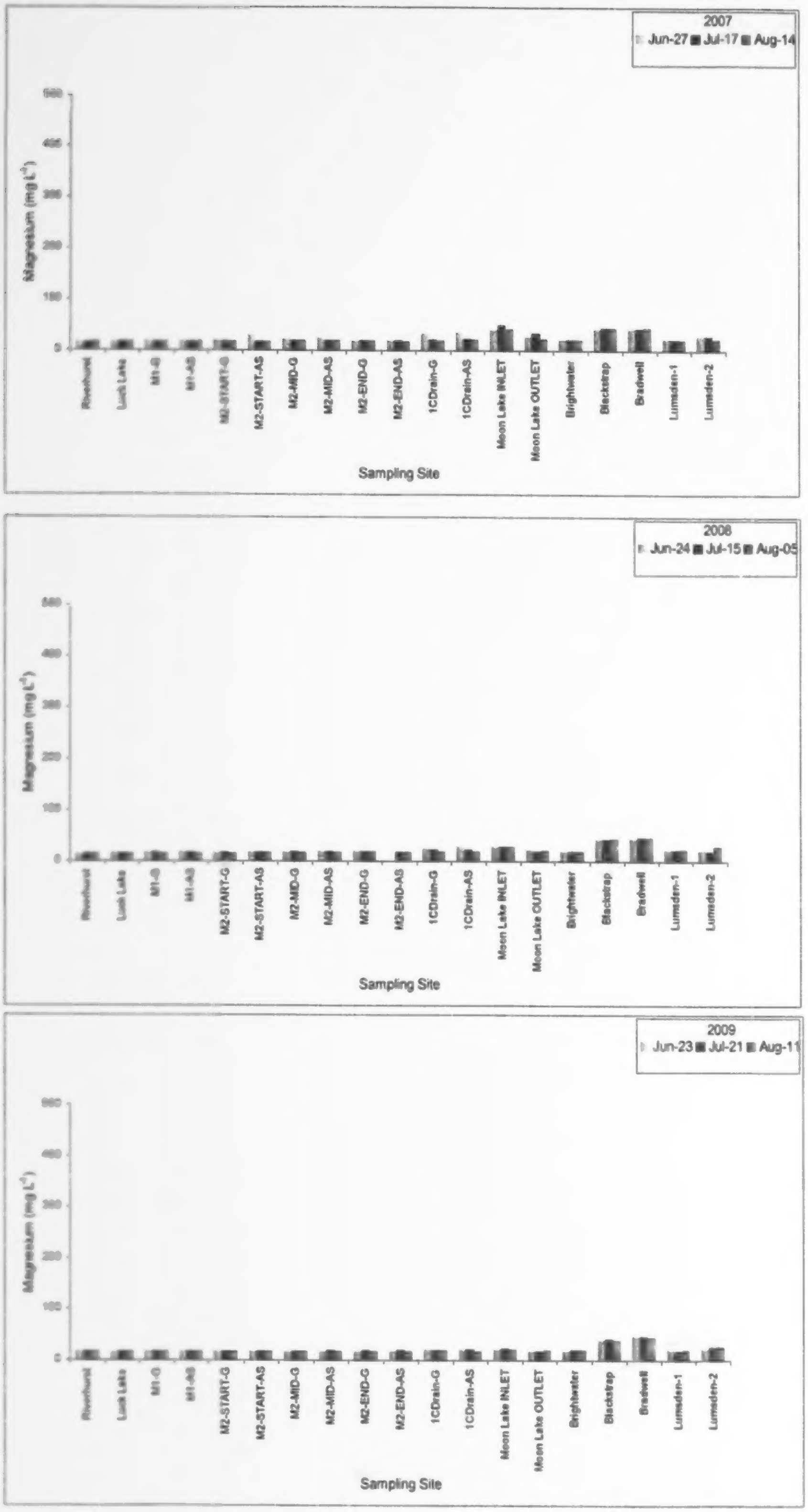


Figure 5. Magnesium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

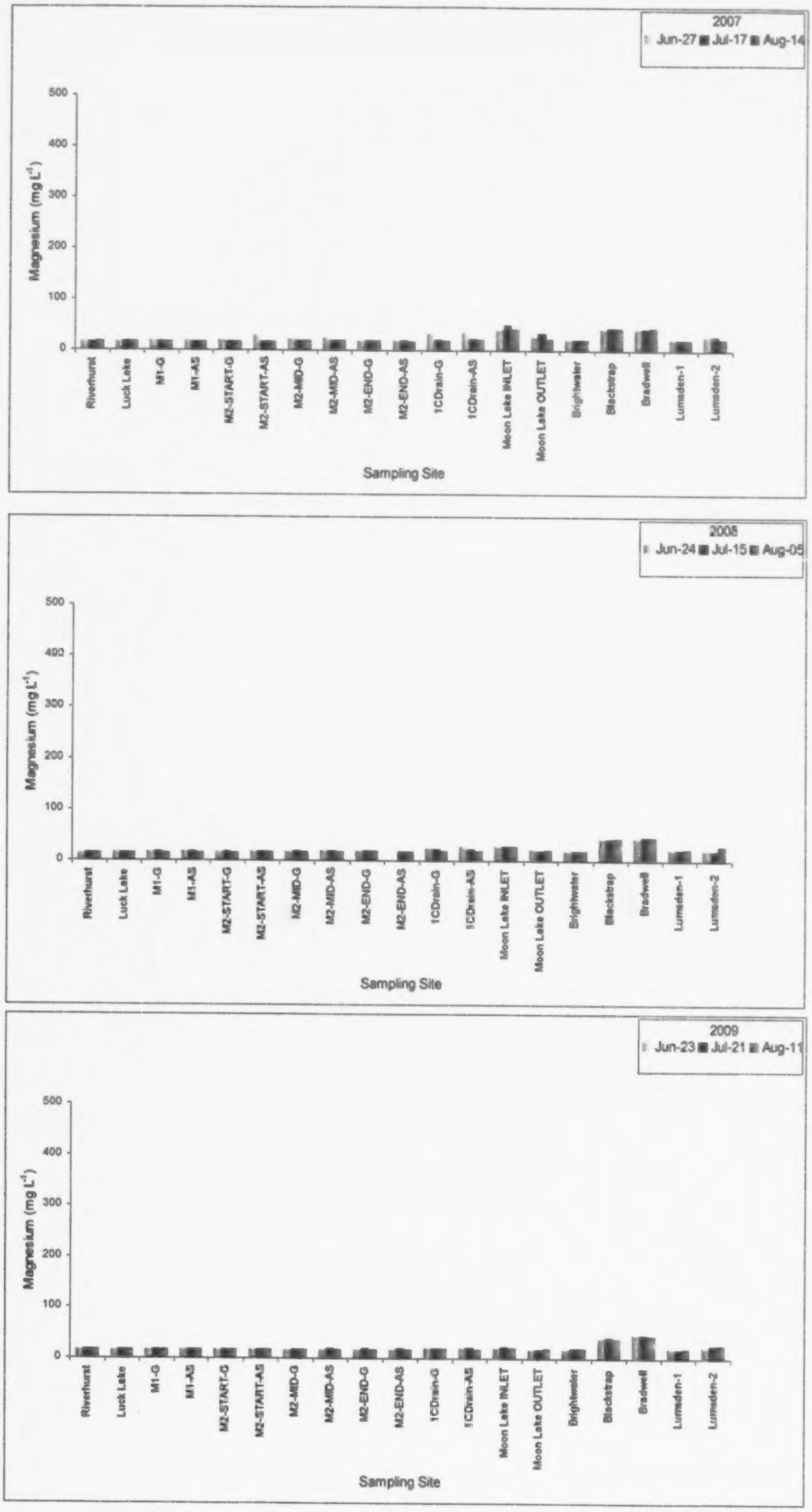


Figure 5. Magnesium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

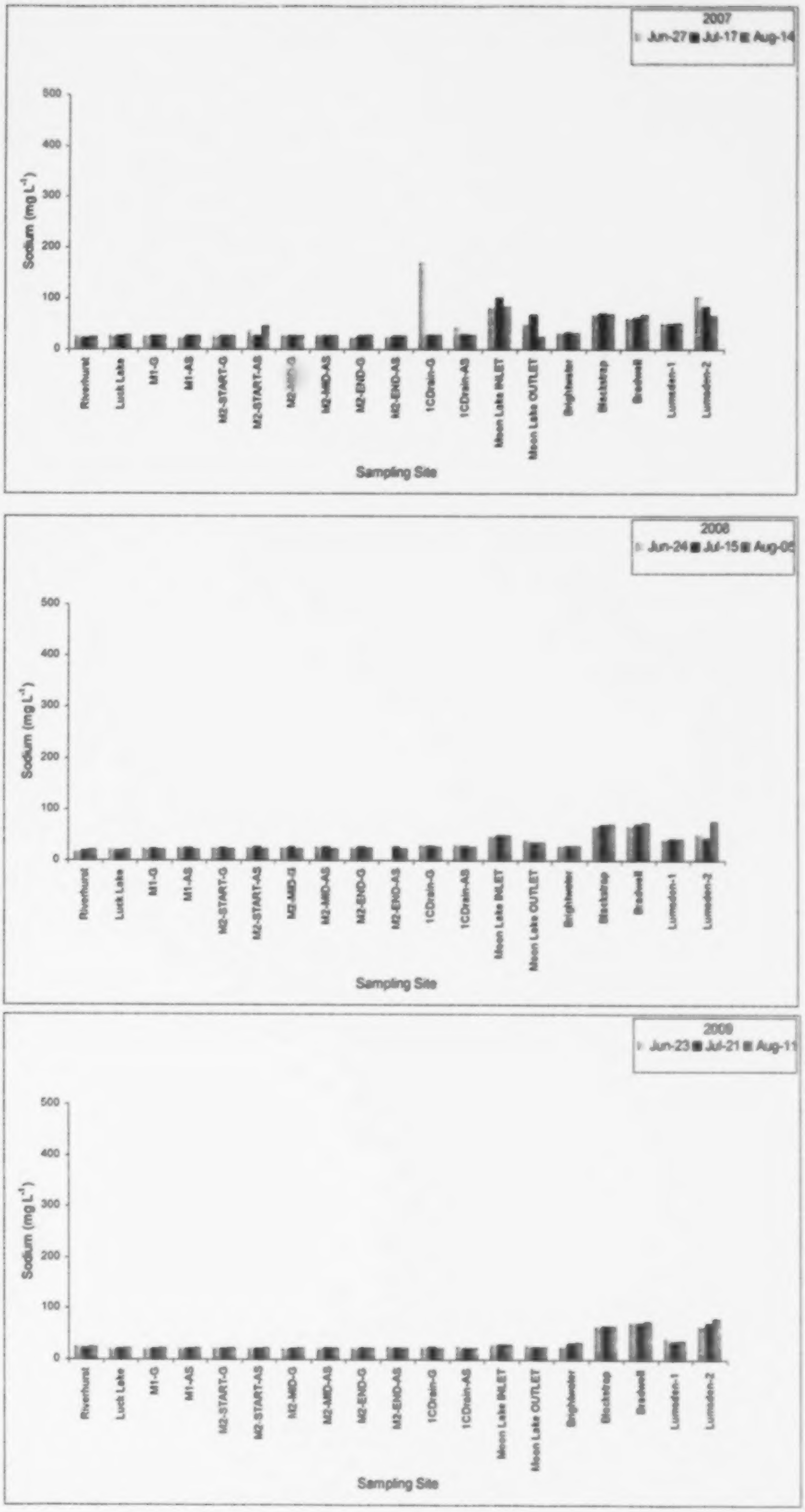


Figure 6. Sodium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

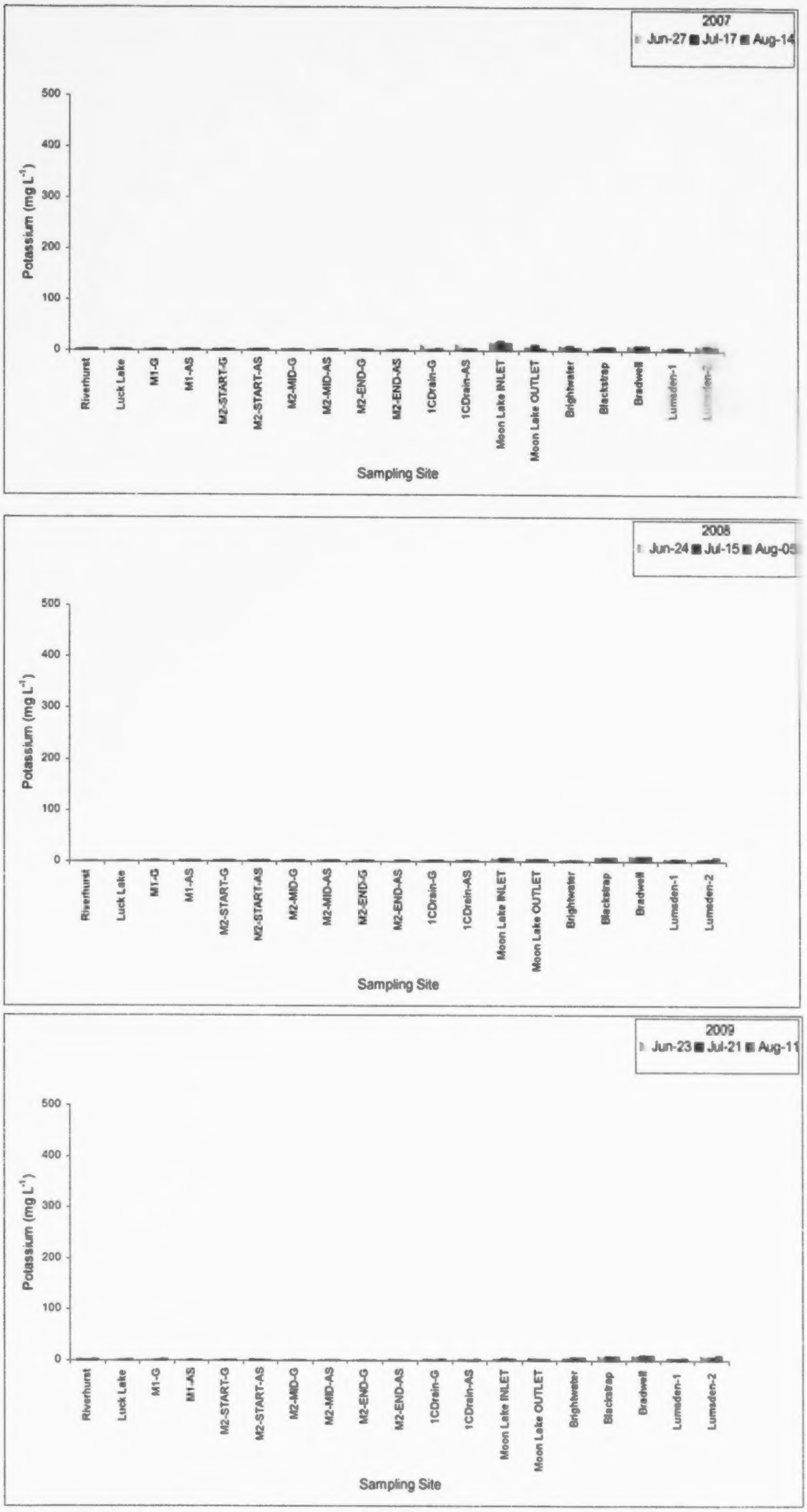


Figure 7. Potassium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

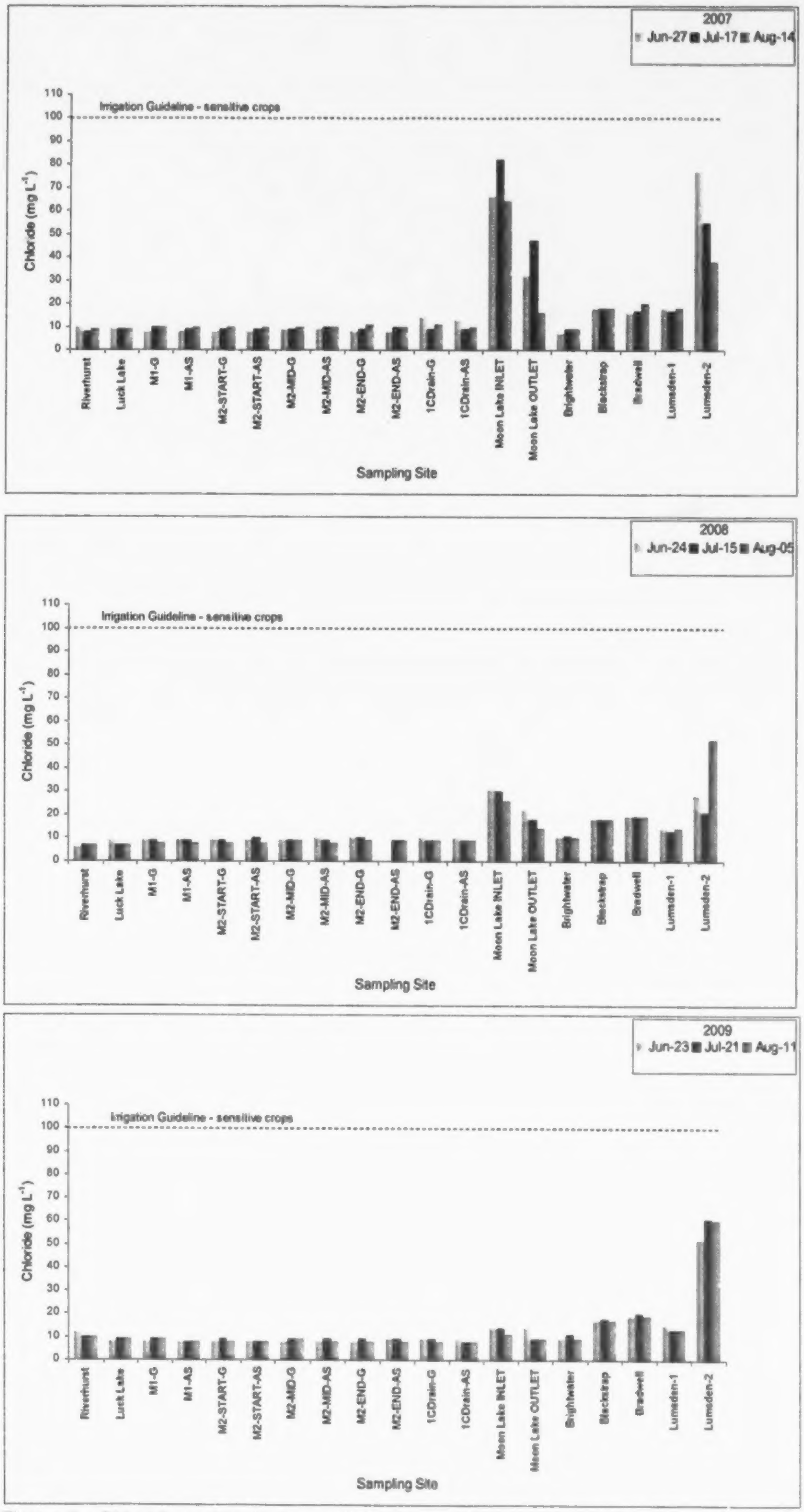


Figure 8. Chloride concentration of irrigation water samples collected at all sampling site for the three year period 2007-2009.

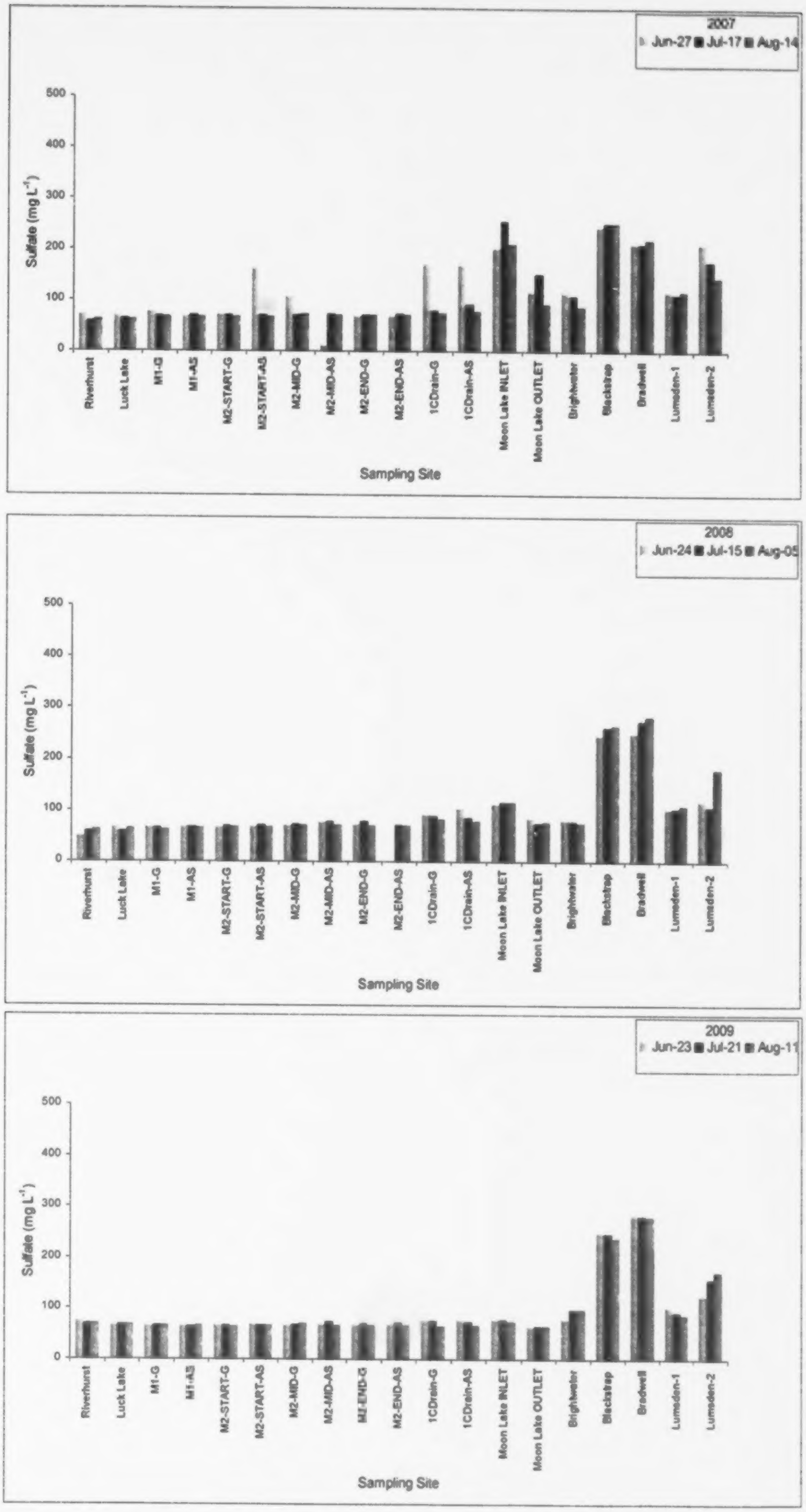


Figure 9. Sulfate concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

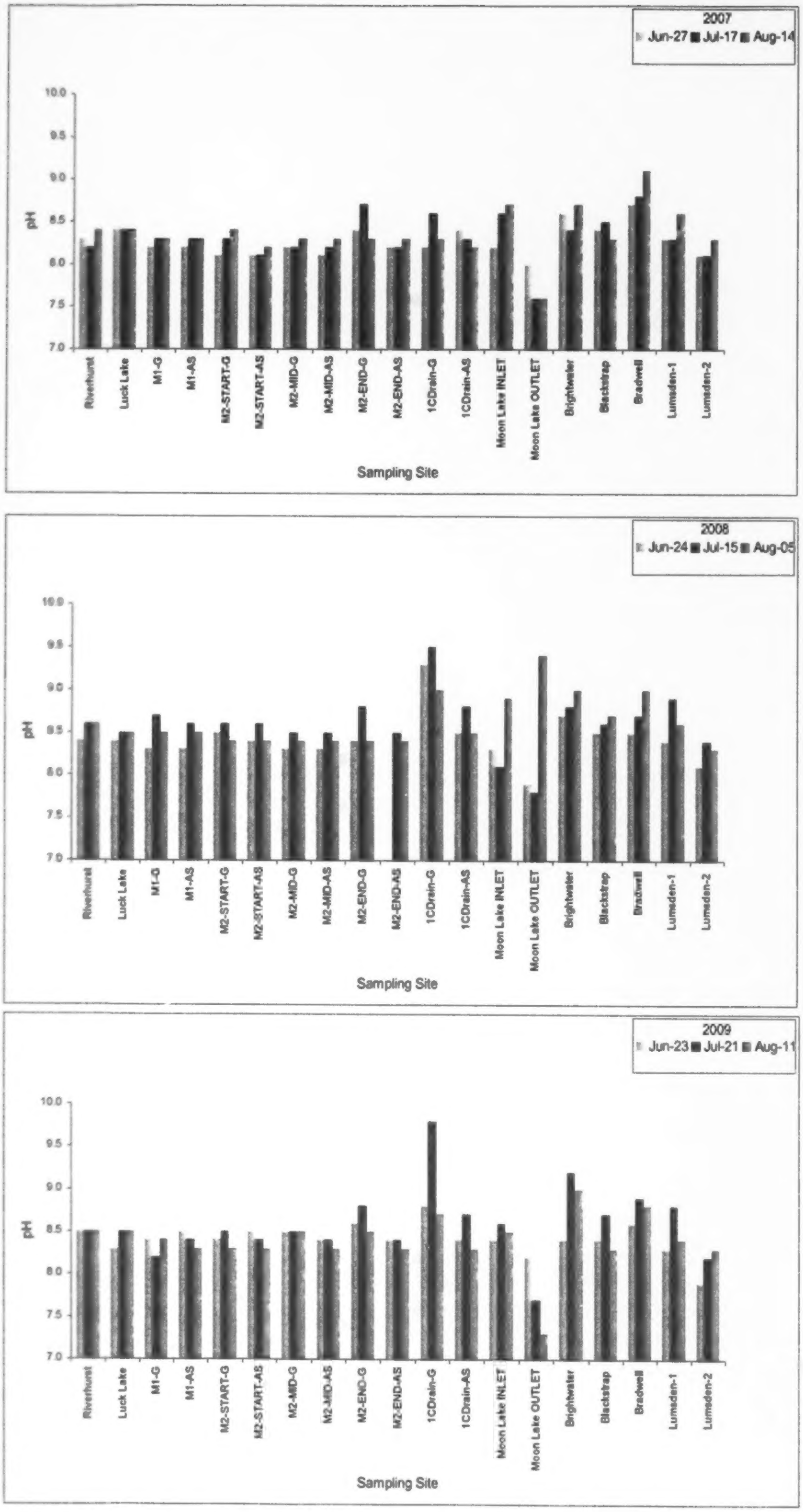


Figure 10.pH of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

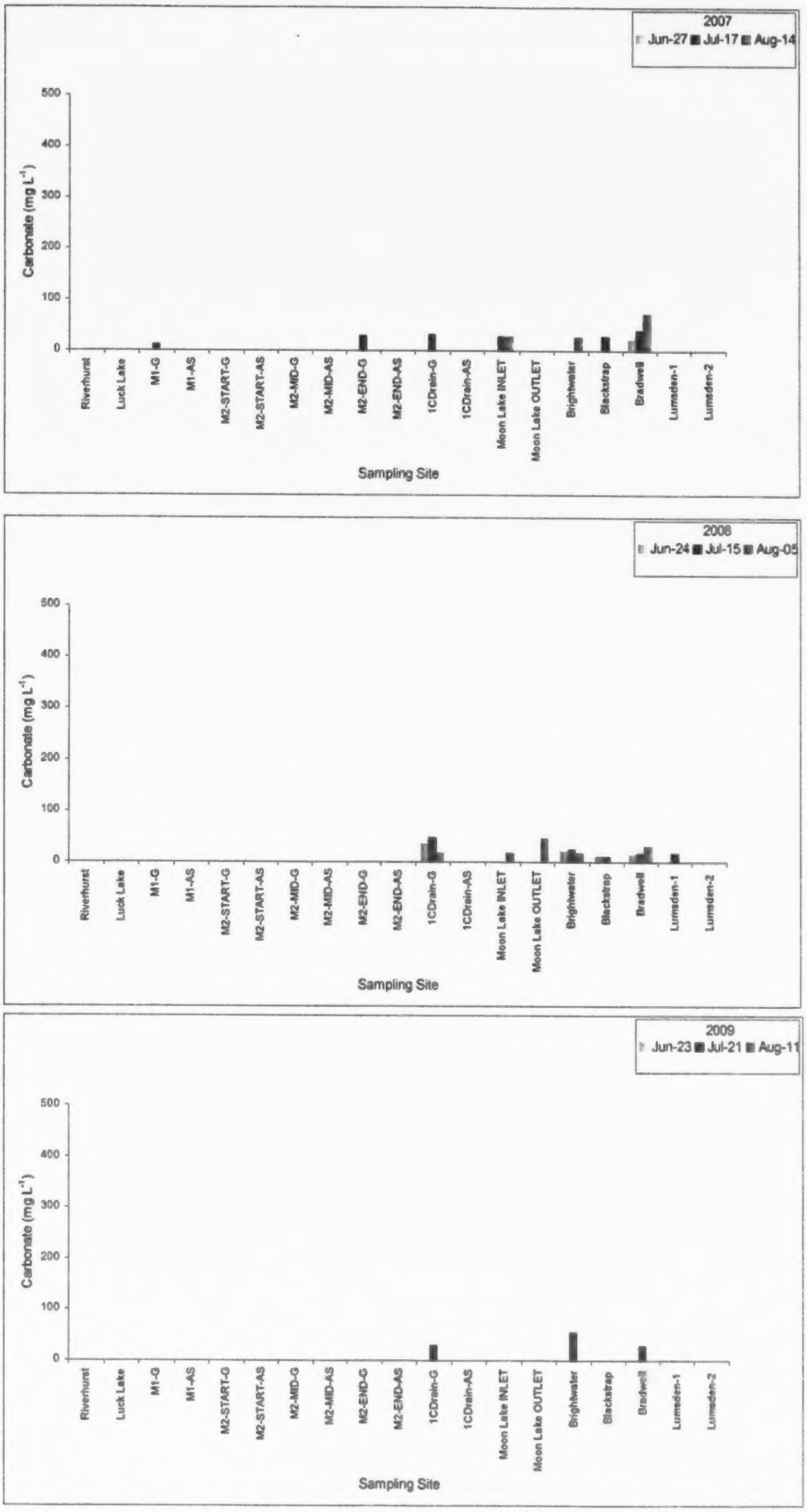


Figure 11.Carbonate concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

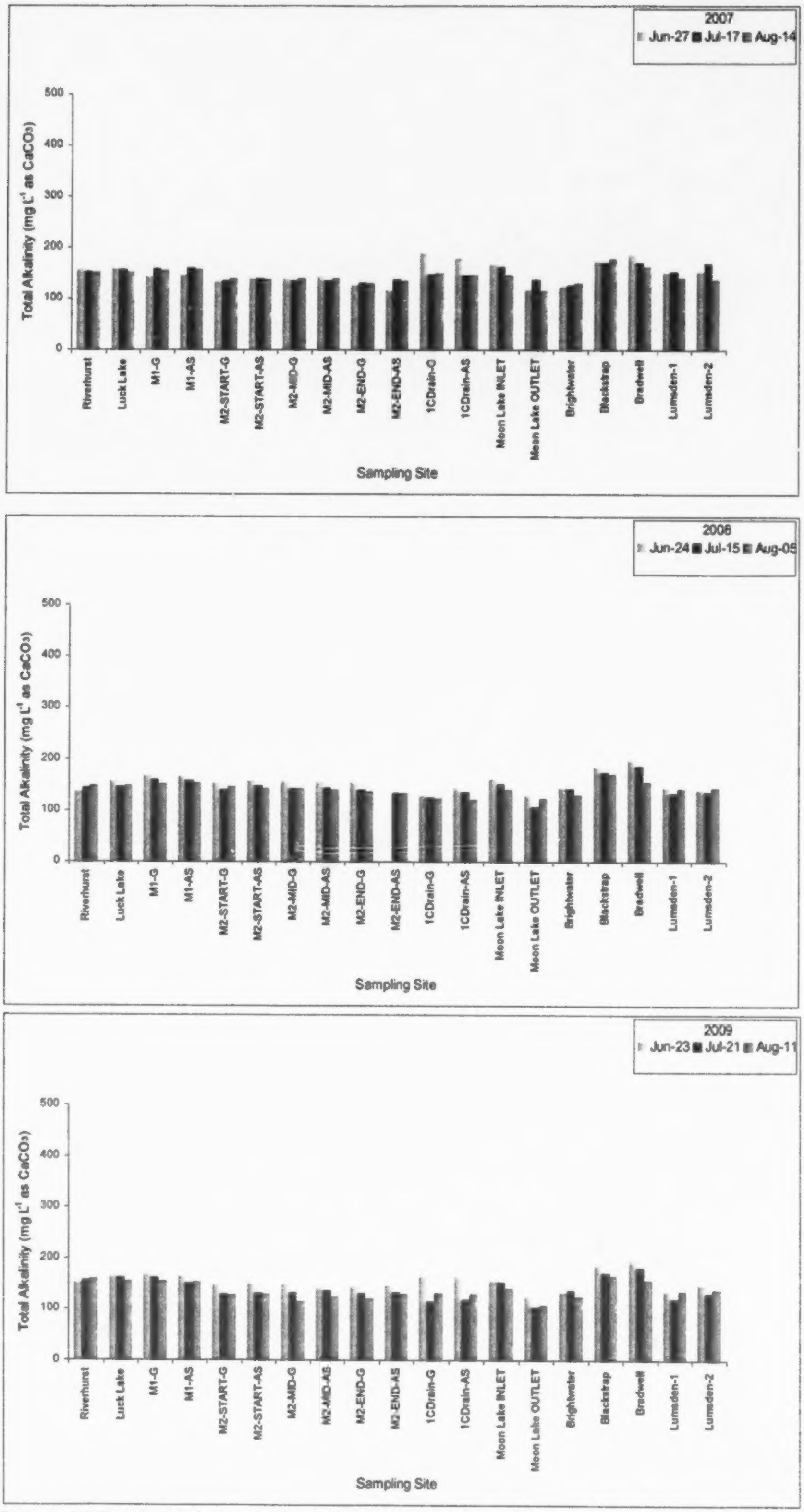


Figure 12.Total alkalinity of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

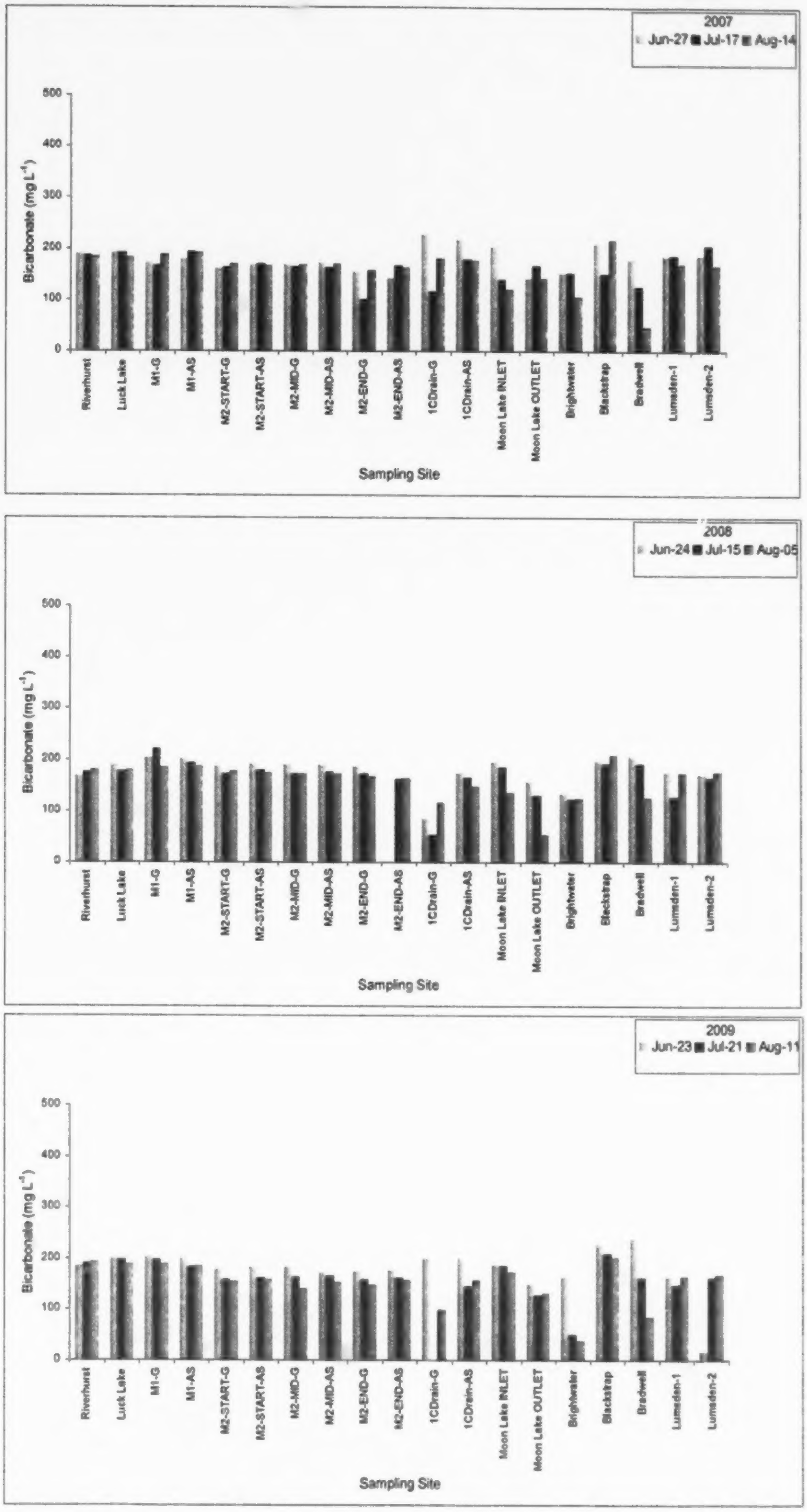


Figure 13.Bicarbonate concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

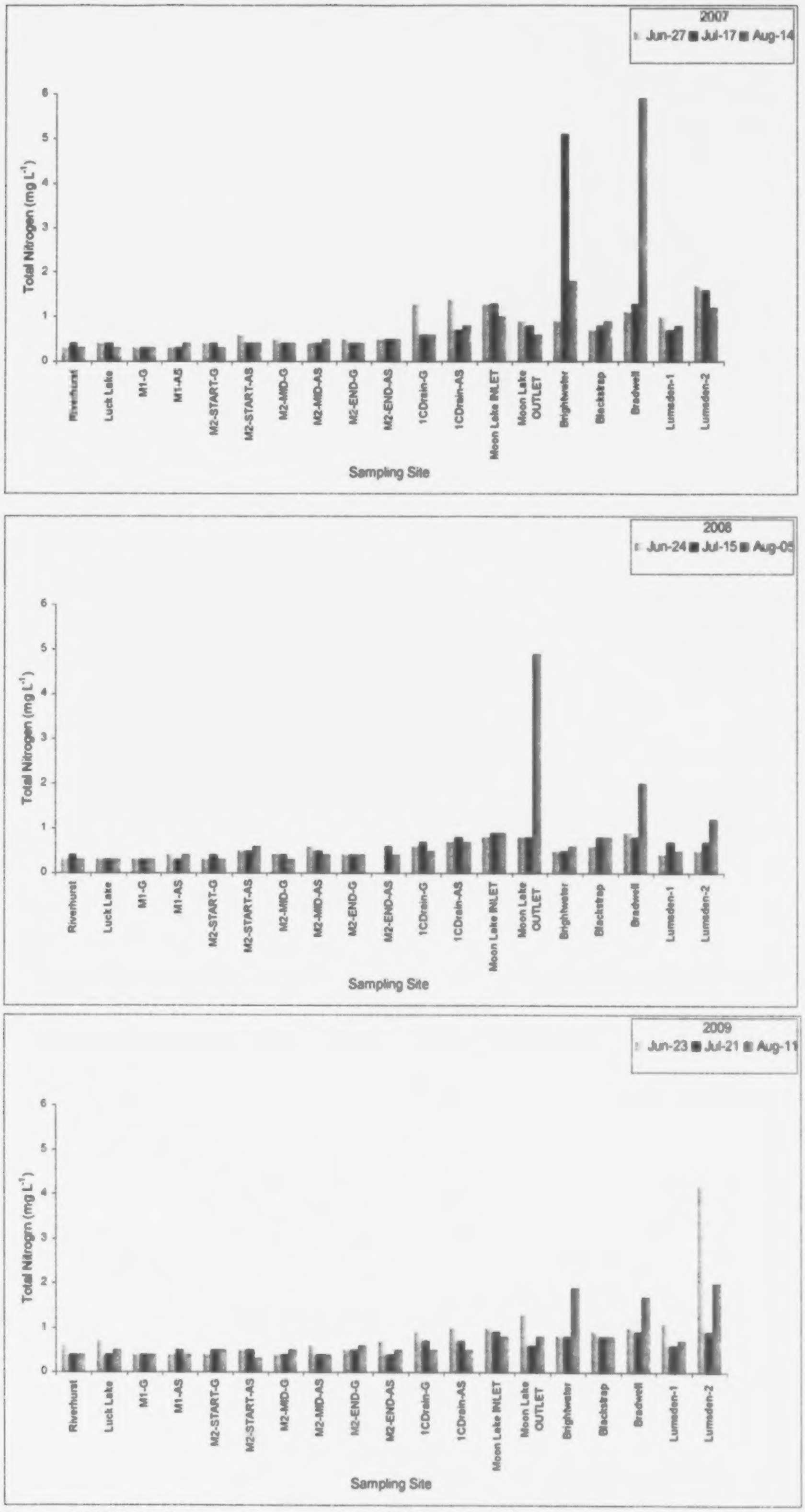


Figure 14. Total nitrogen concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

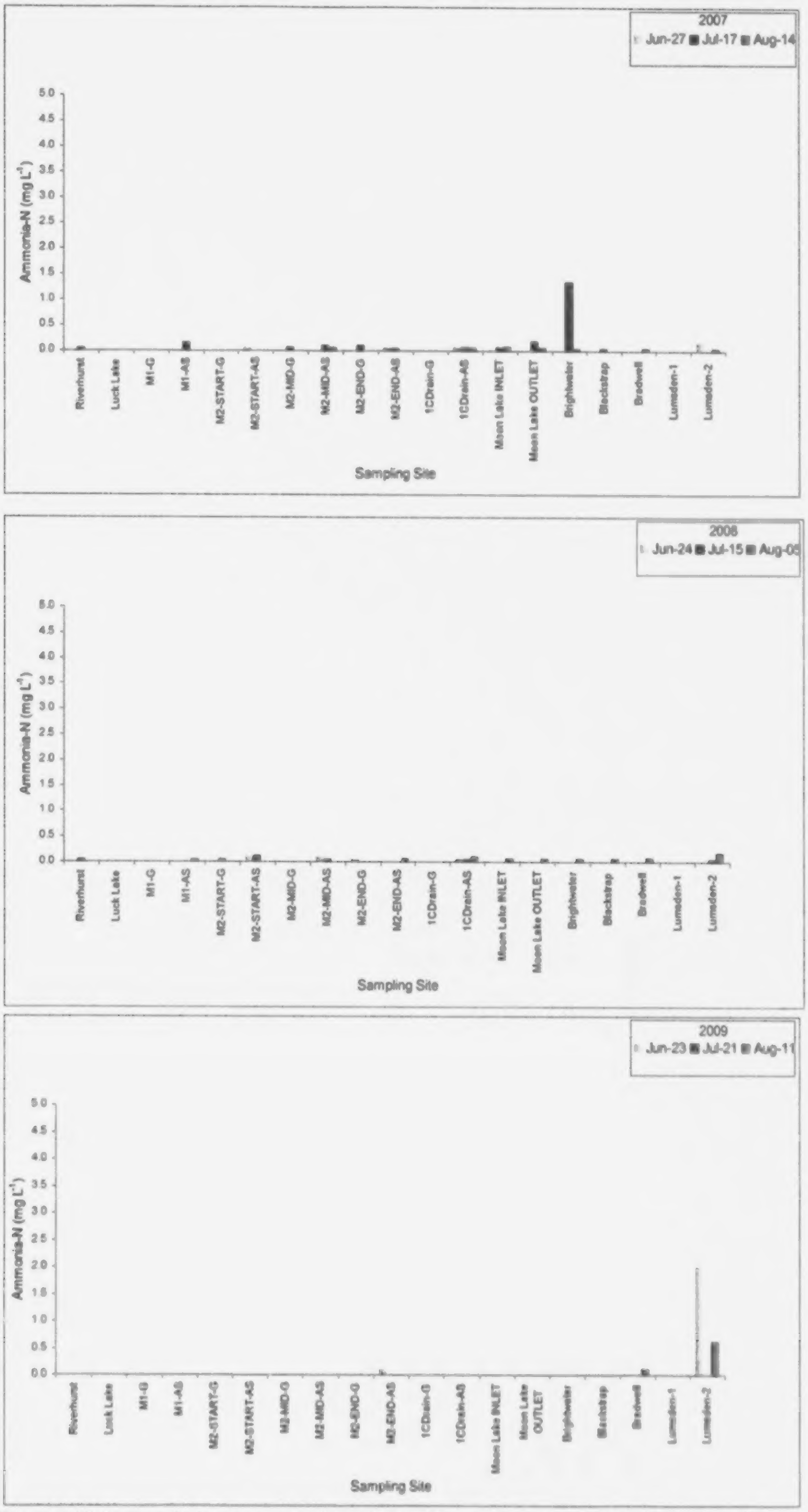


Figure 15.Ammonia-N concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

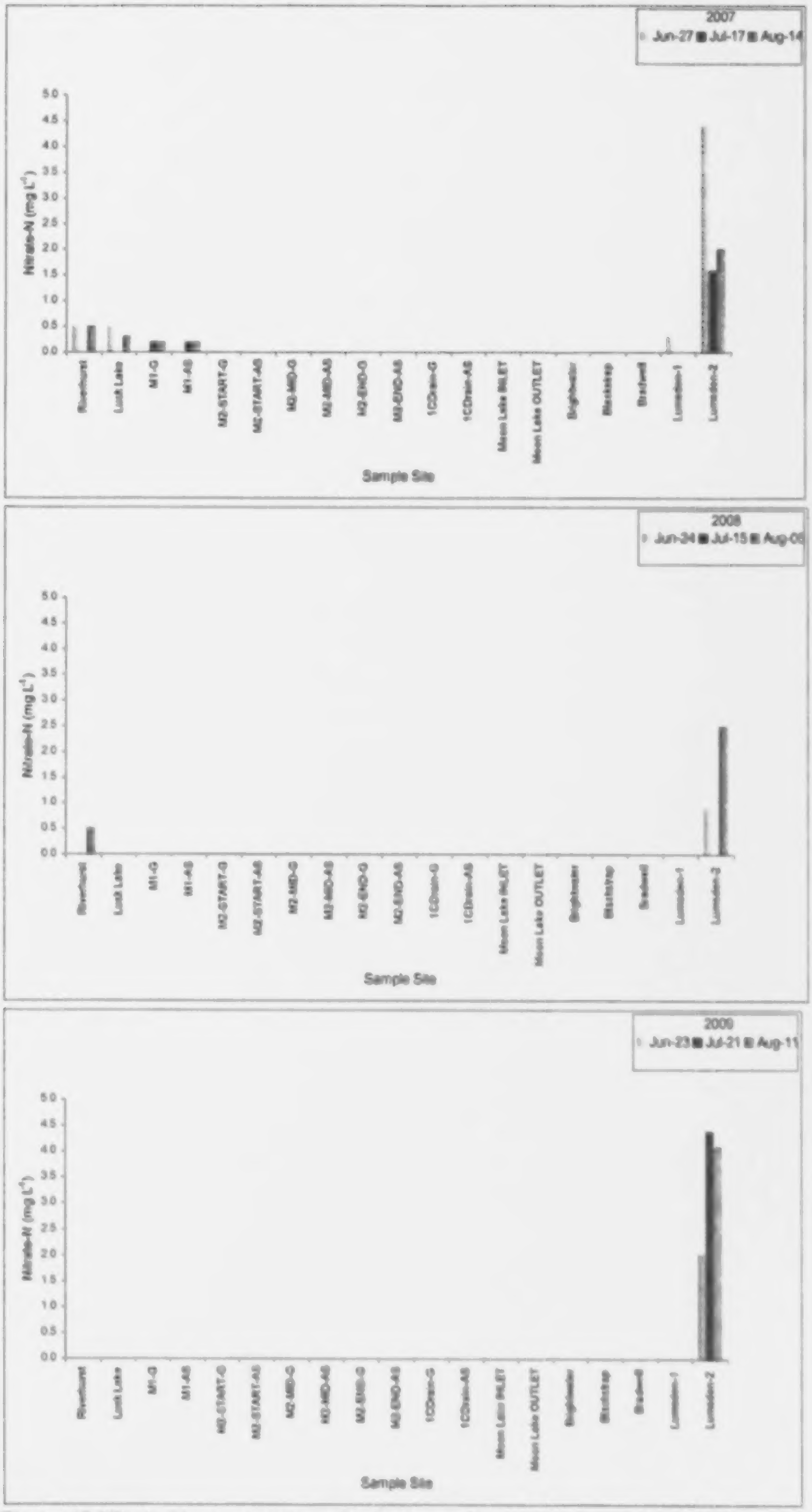


Figure 16.Nitrate-N concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

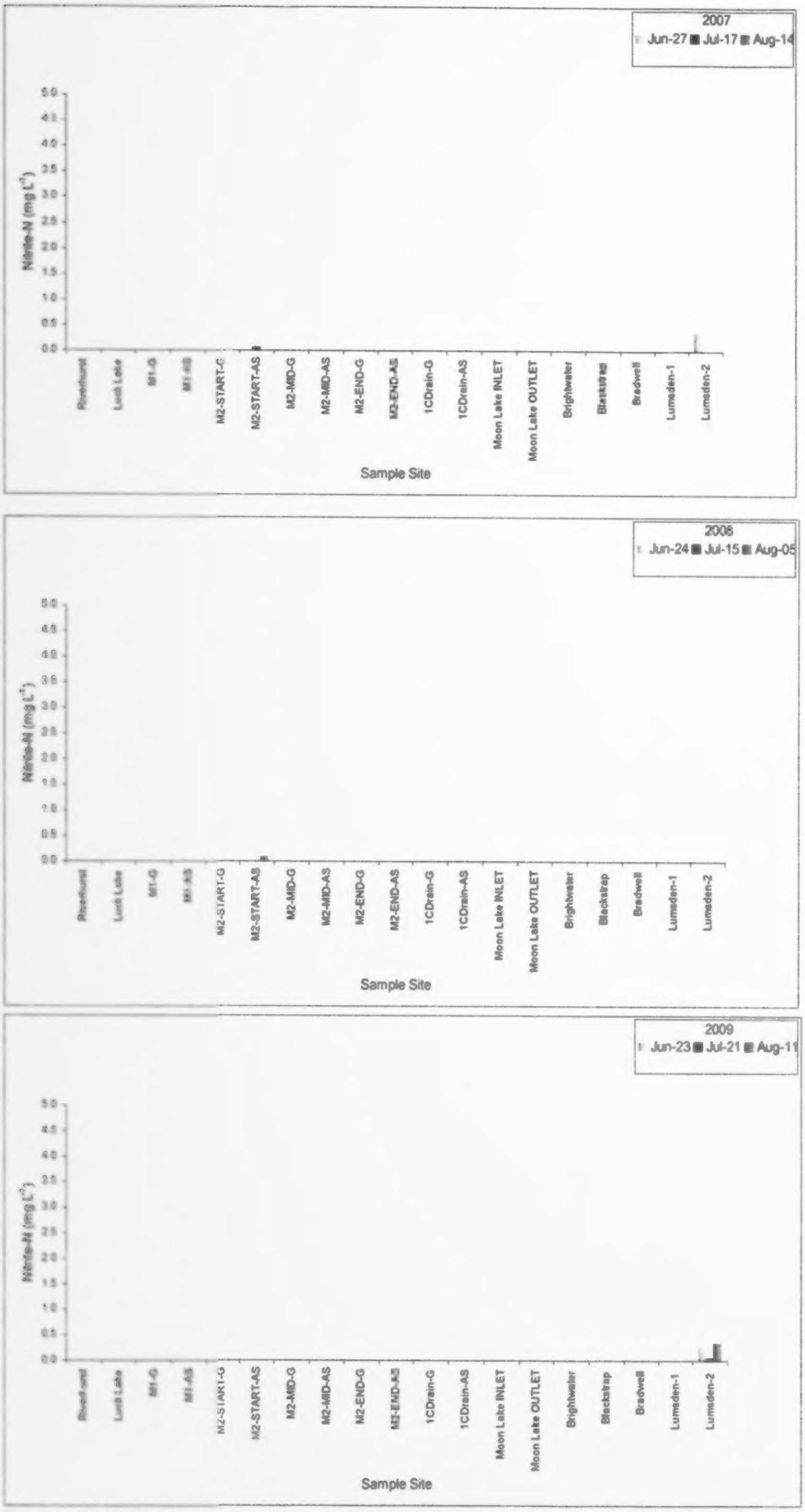


Figure 17.Nitrite-N concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

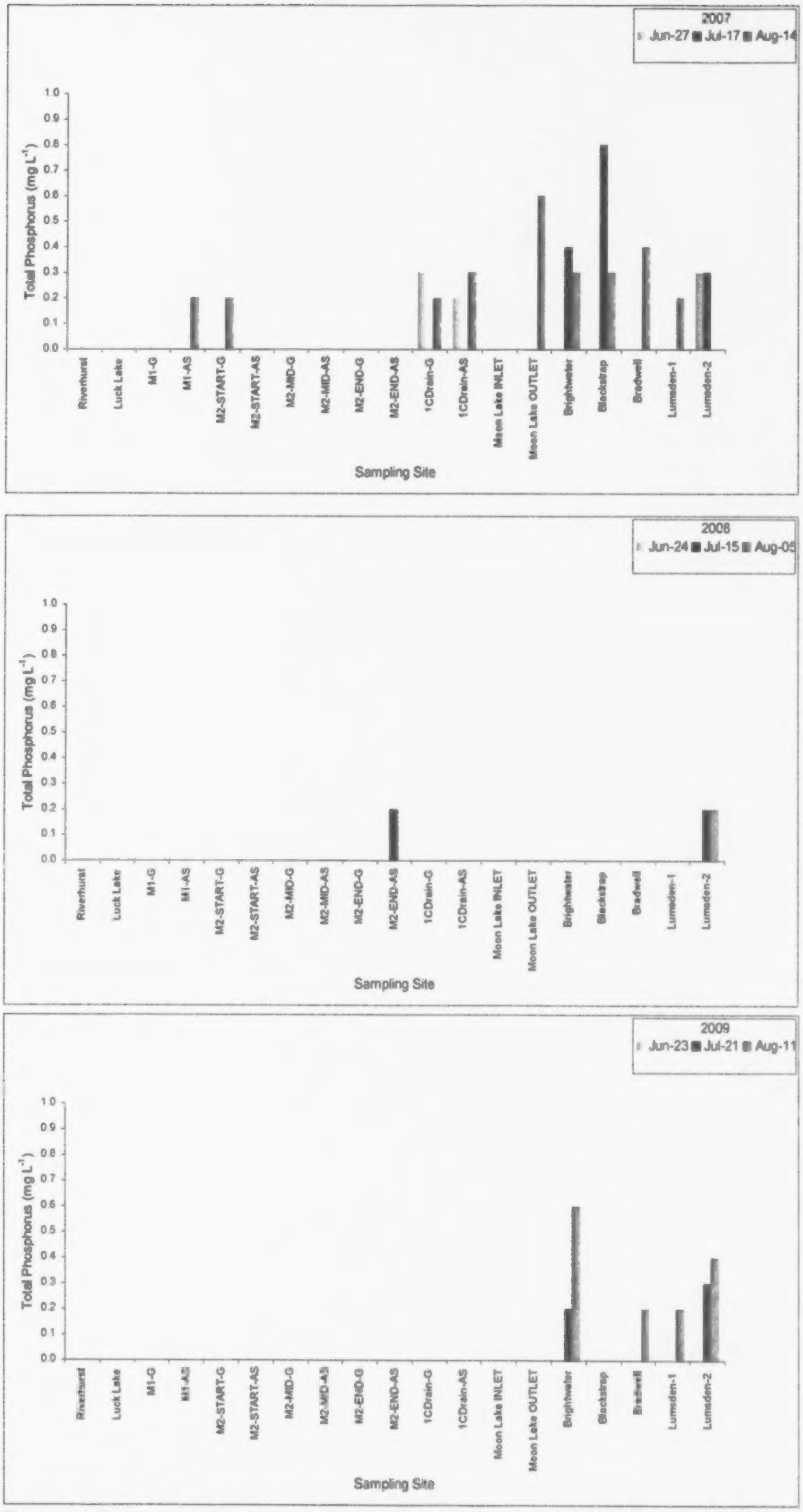


Figure 18.Total phosphorus concentration of irrigation water samples collected at all sites for the three year period 2007-2009.

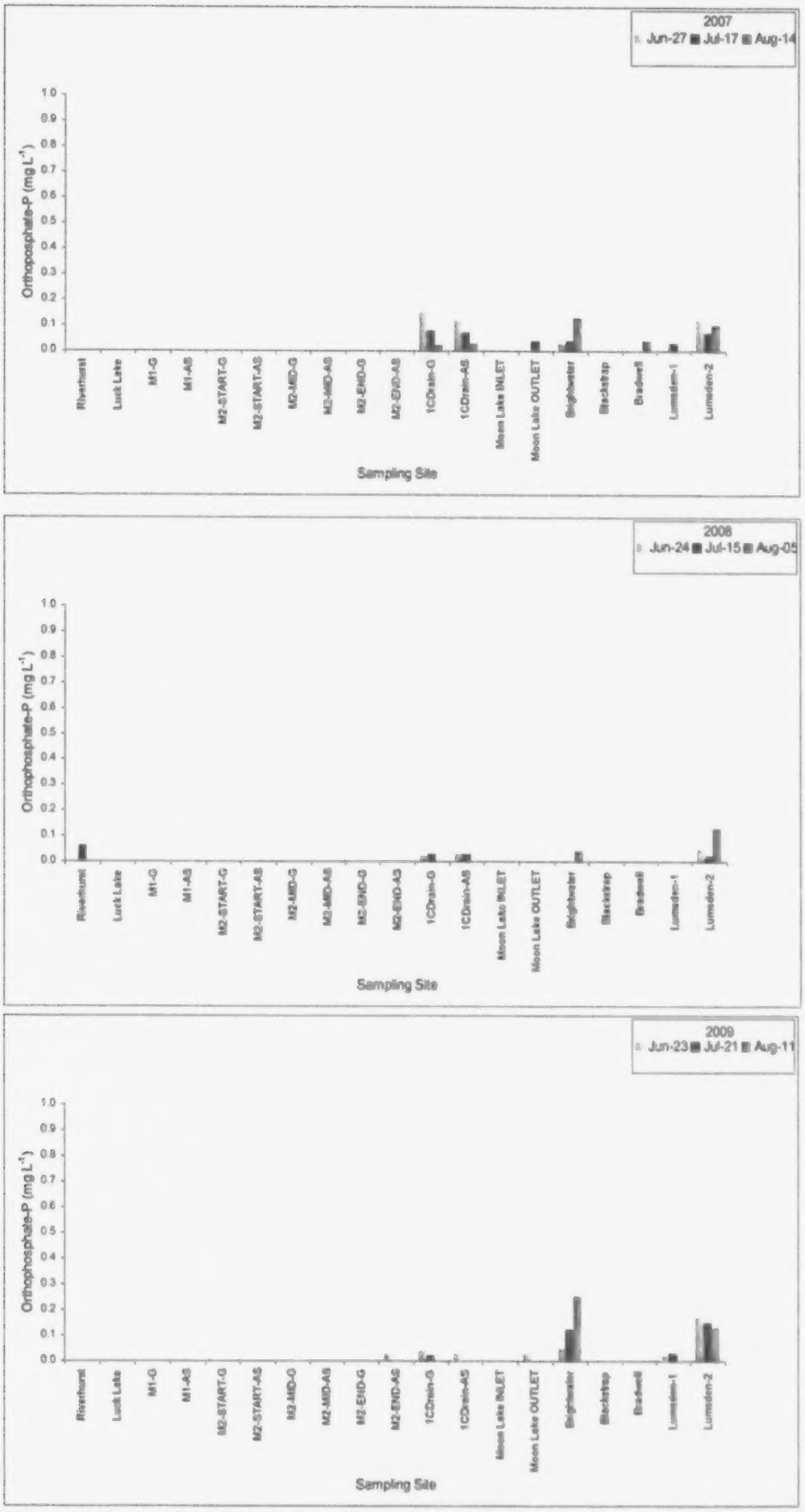


Figure 19.Orthophosphate-P concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

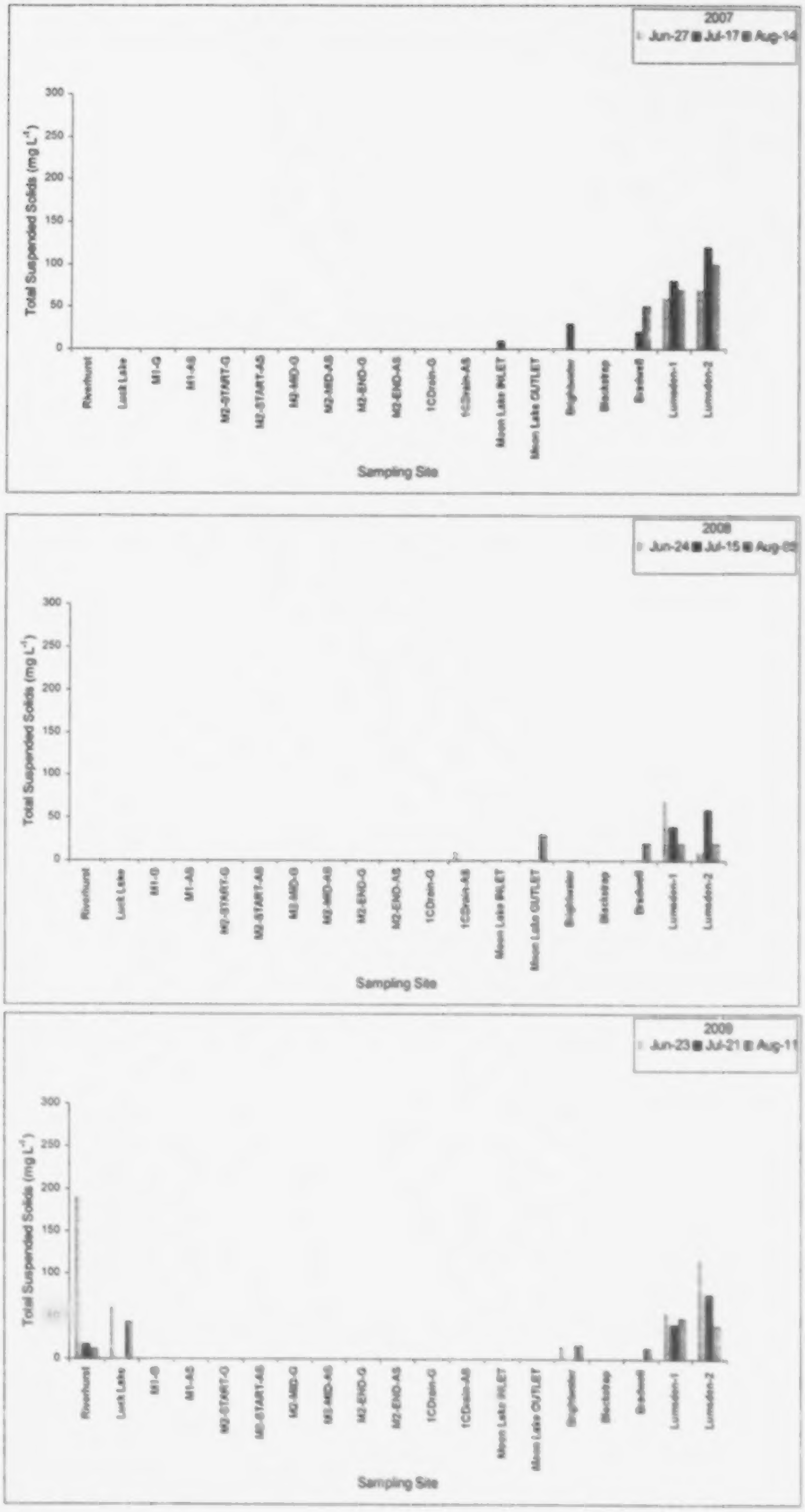


Figure 20.Total suspended solids concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

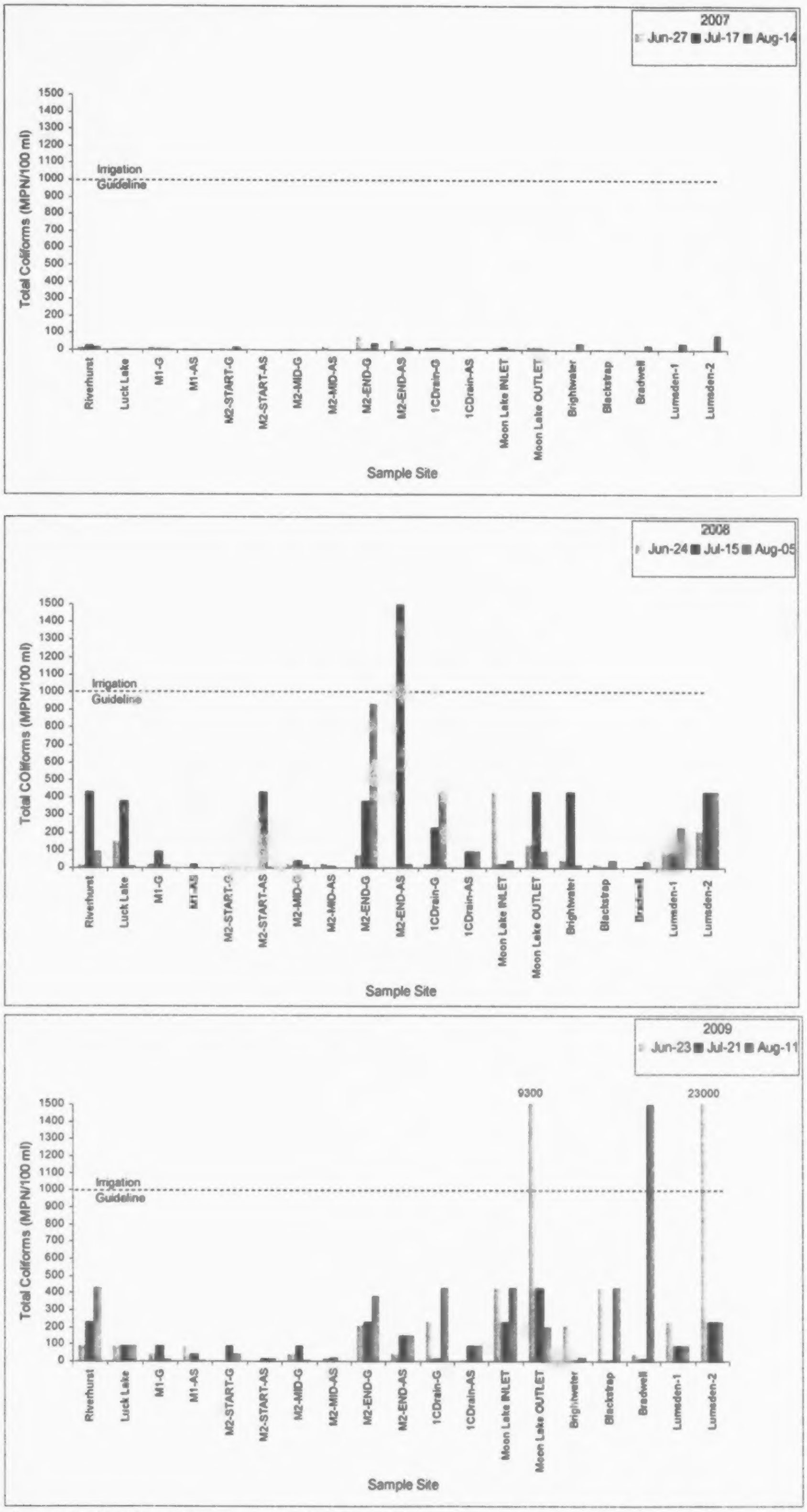


Figure 21. Total coliform concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

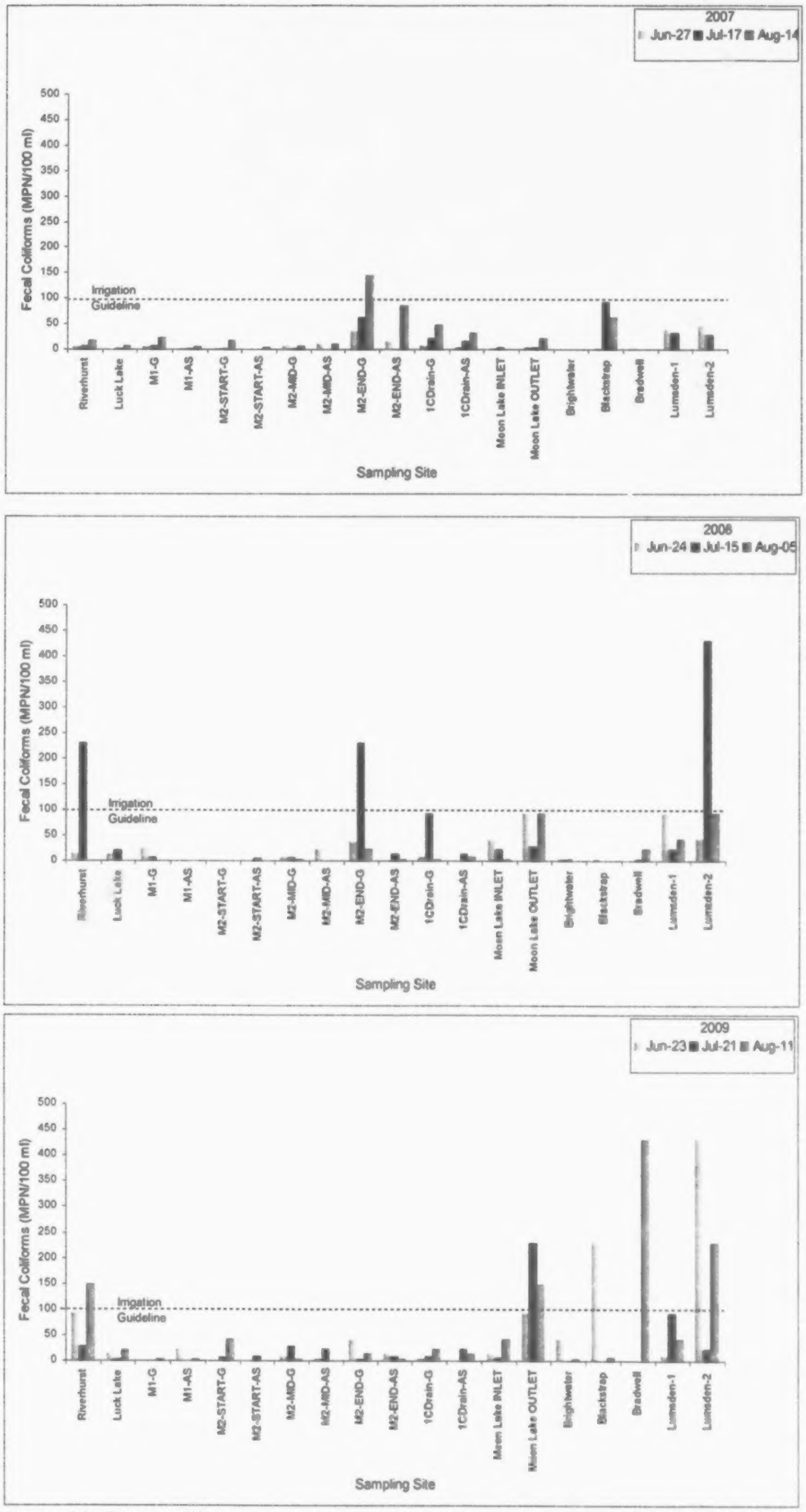


Figure 22. Fecal coliform concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

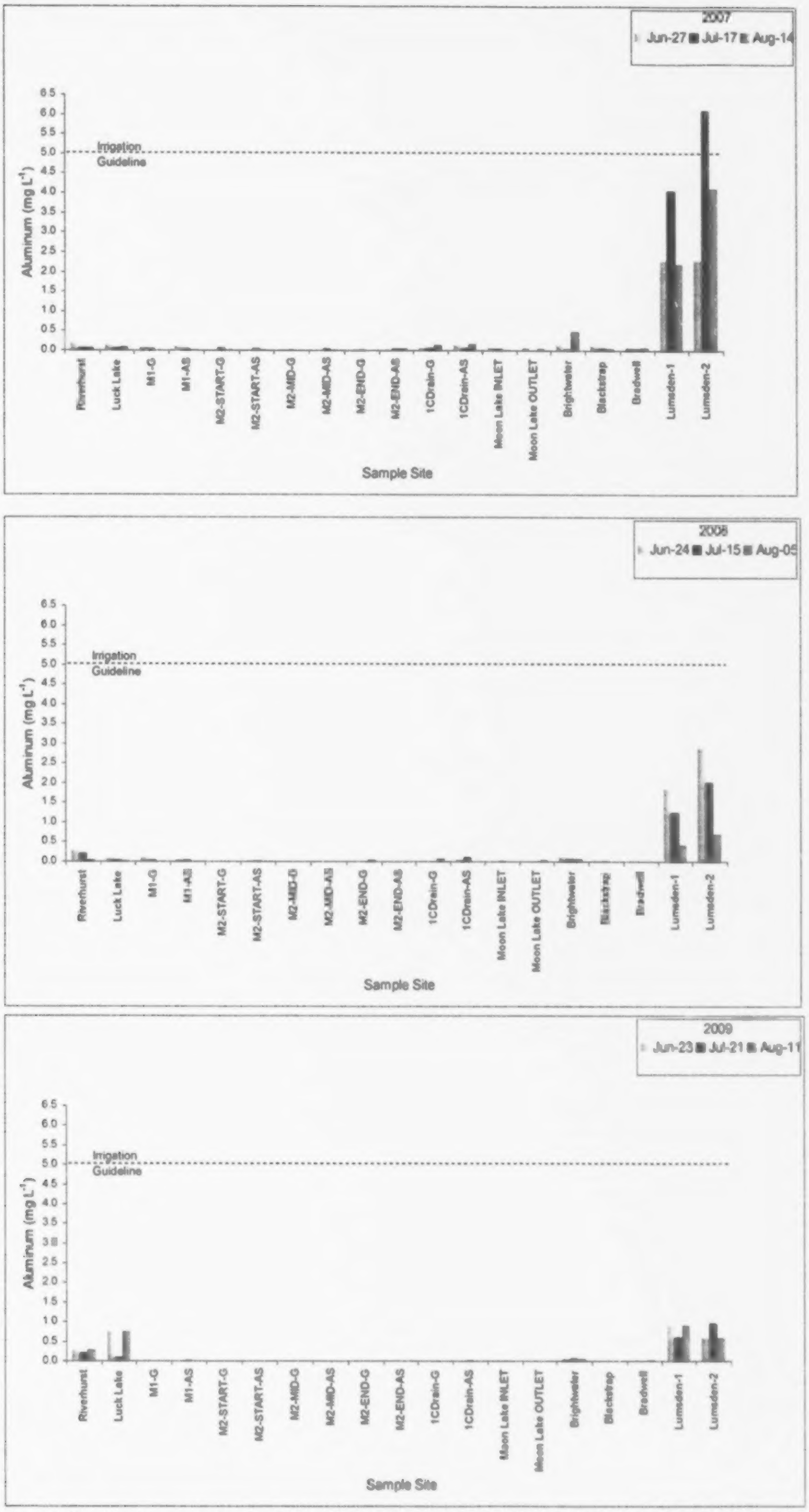


Figure 23. Aluminum concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

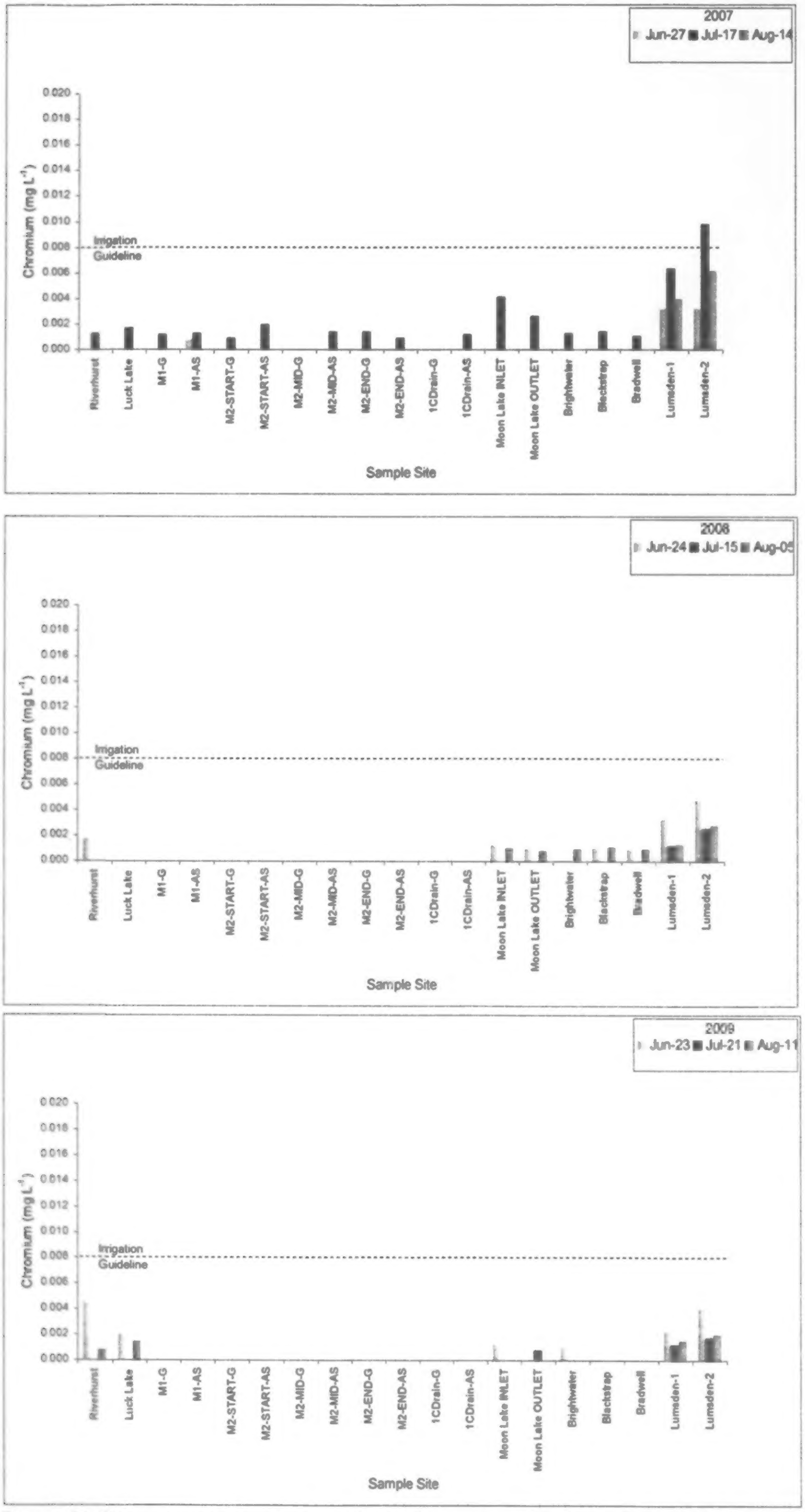


Figure 24. Chromium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

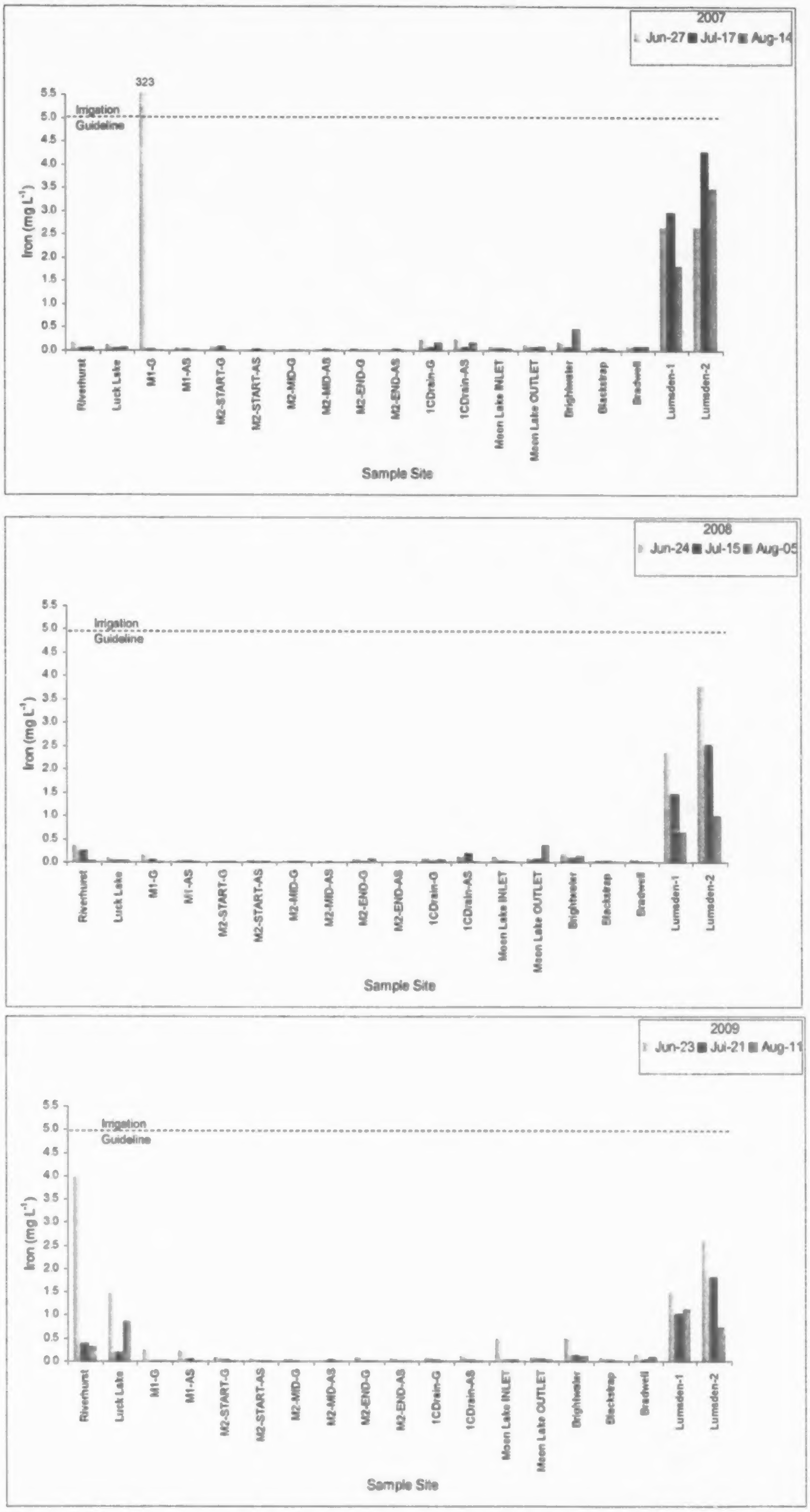


Figure 25.Iron concentration of irrigation water samples collected from all sampling sites for the three year period 2007-2009.

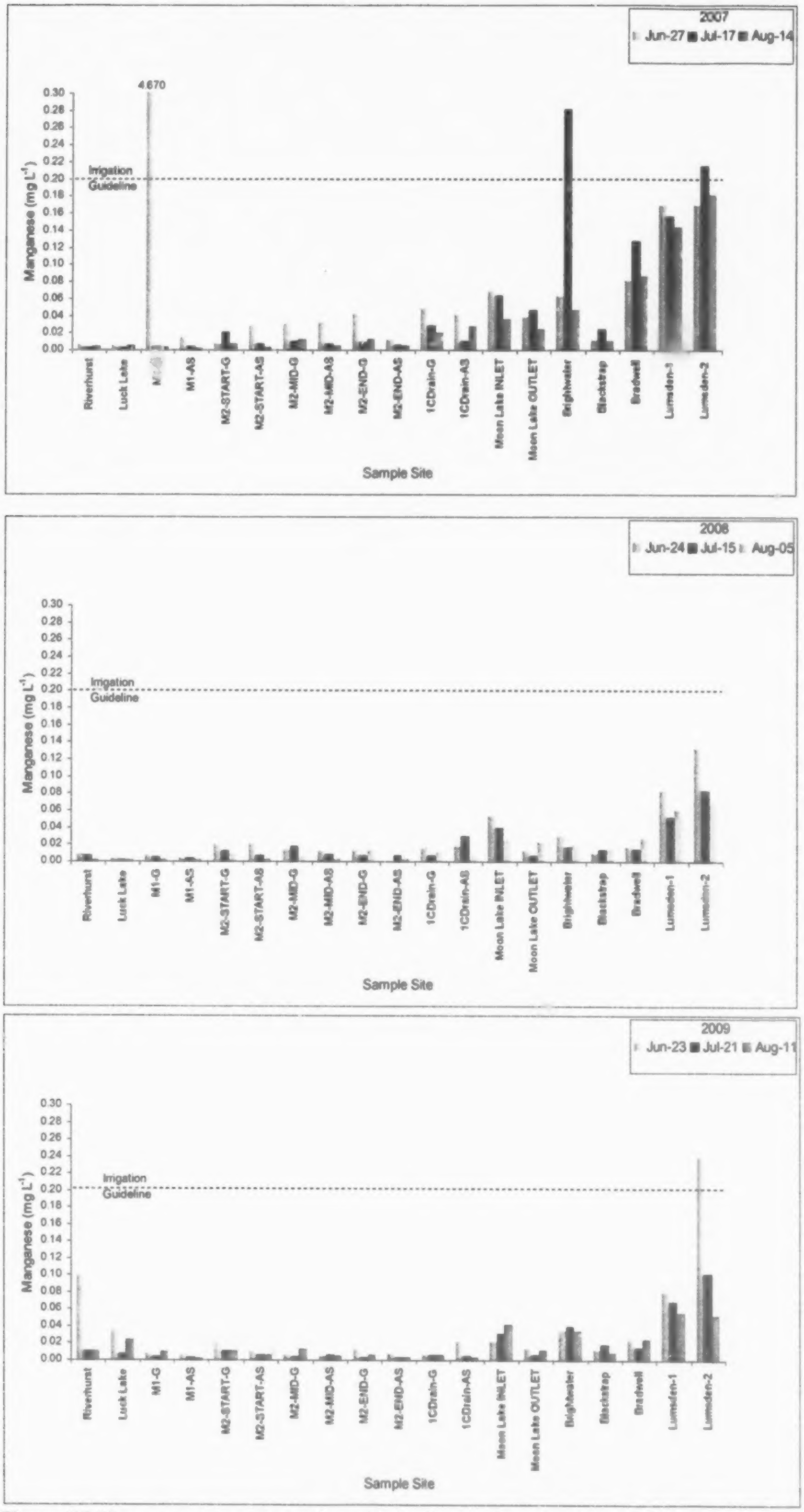


Figure 26.Manganese concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

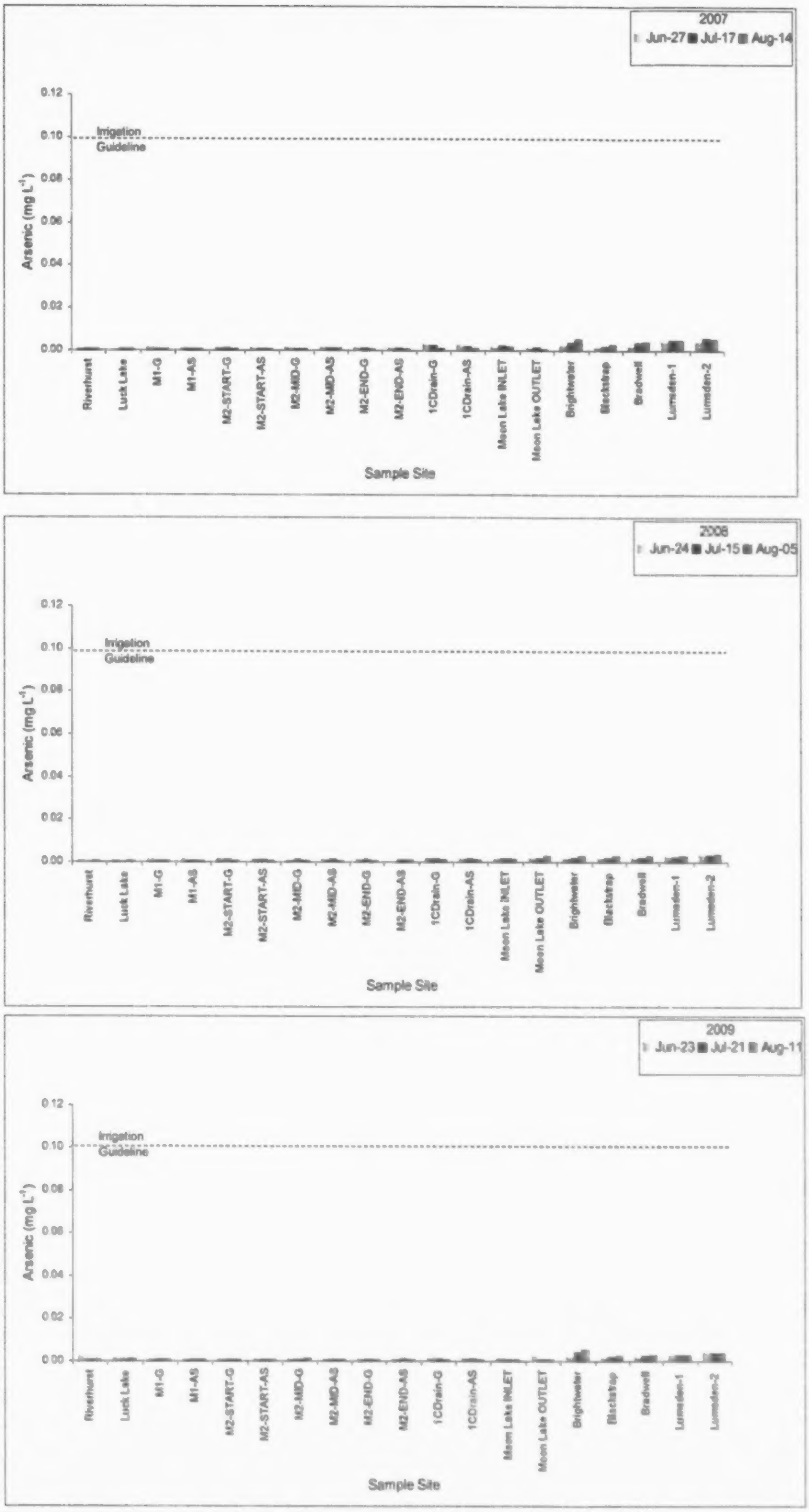


Figure 27.Arsenic concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

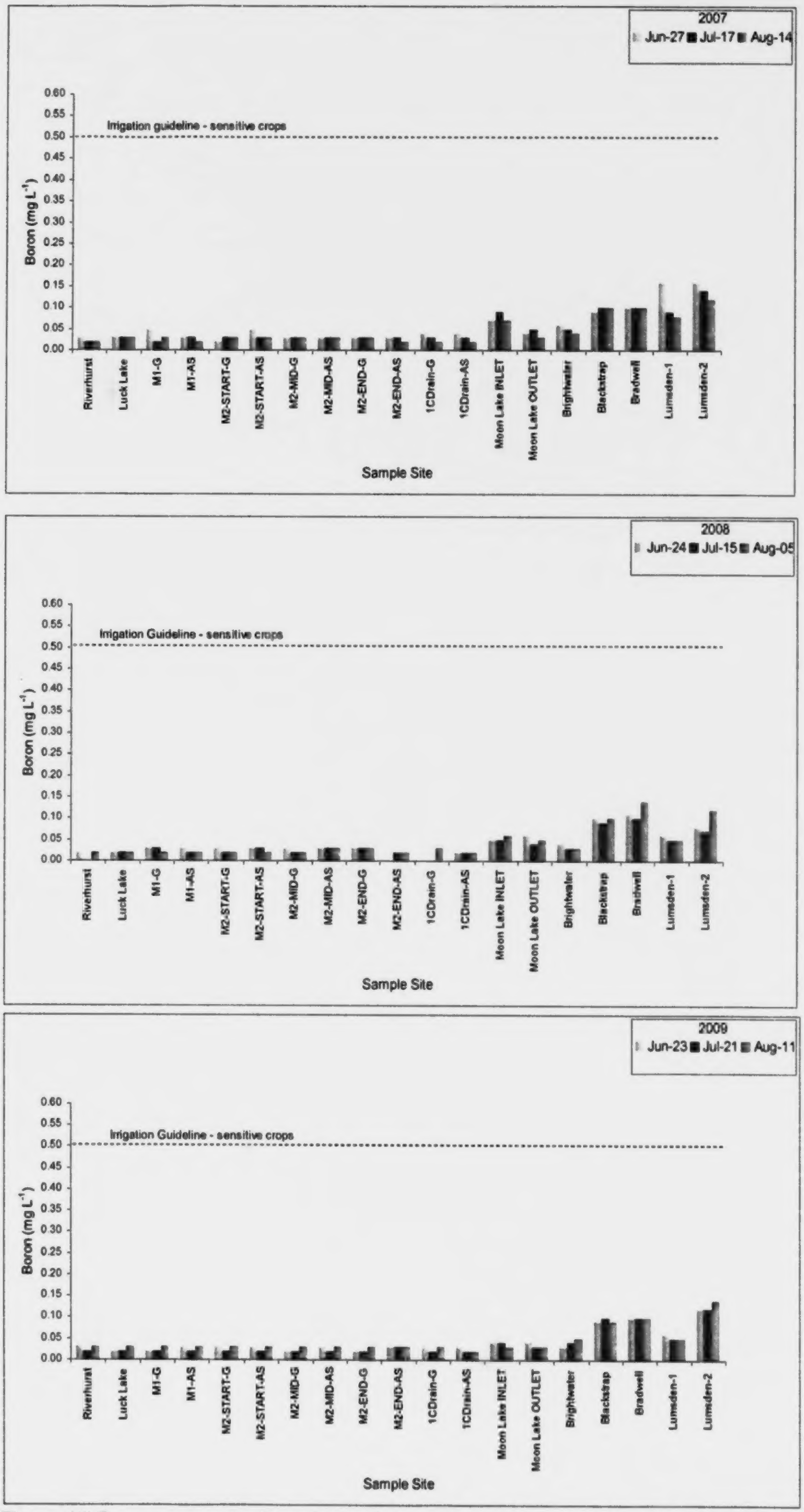


Figure 28.Boron concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

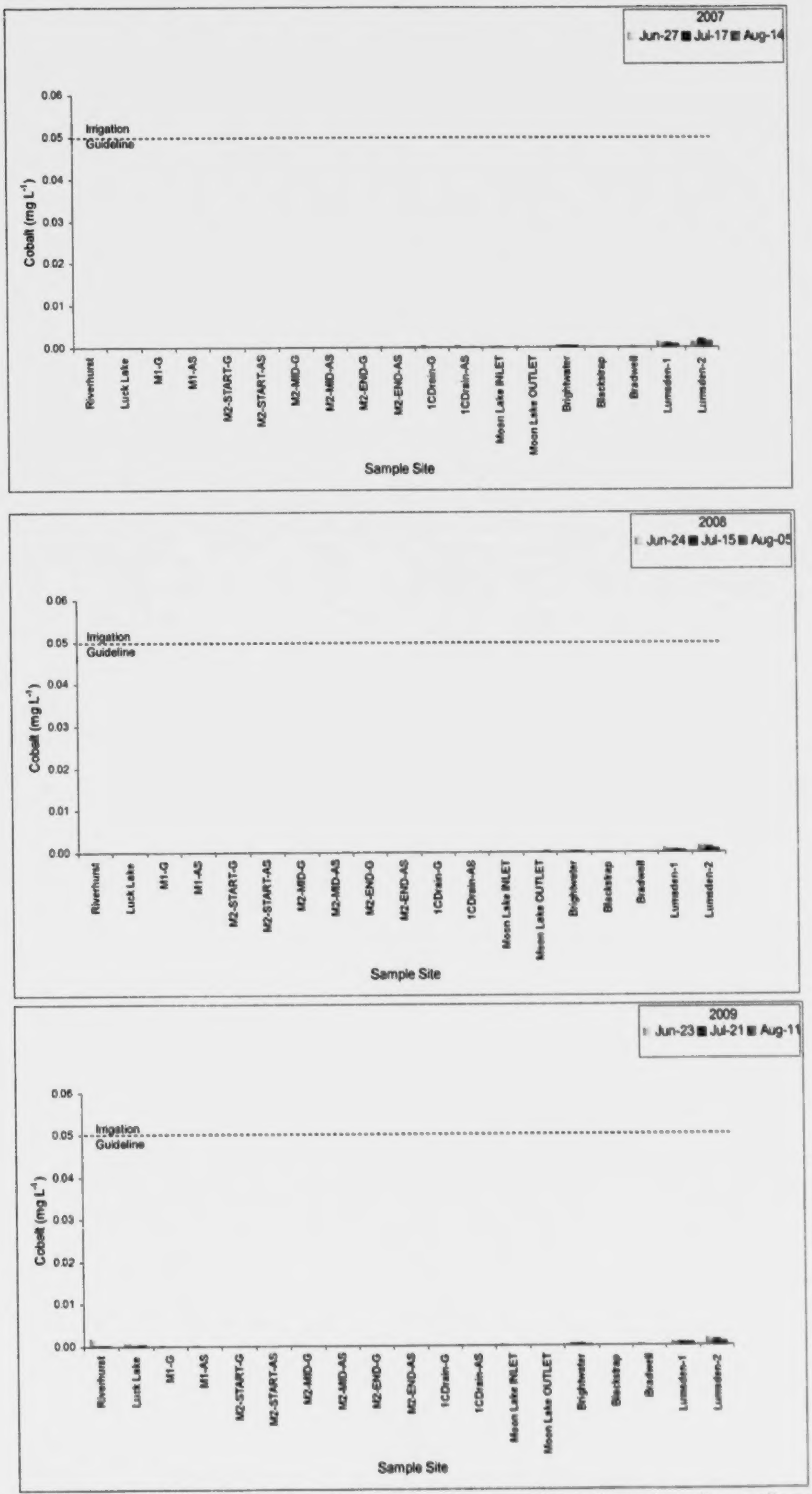


Figure 29.Cobalt concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

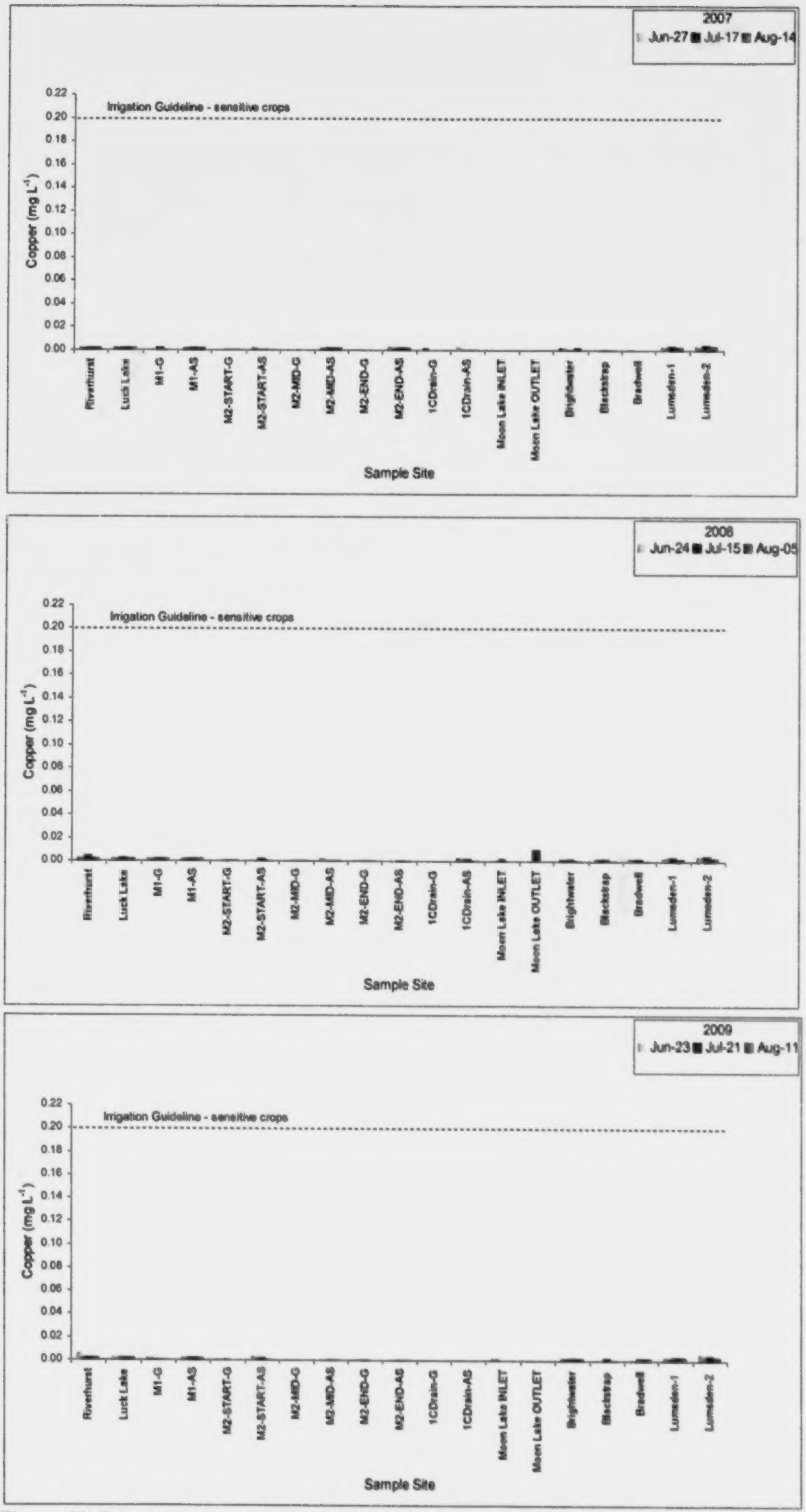


Figure 30.Copper concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

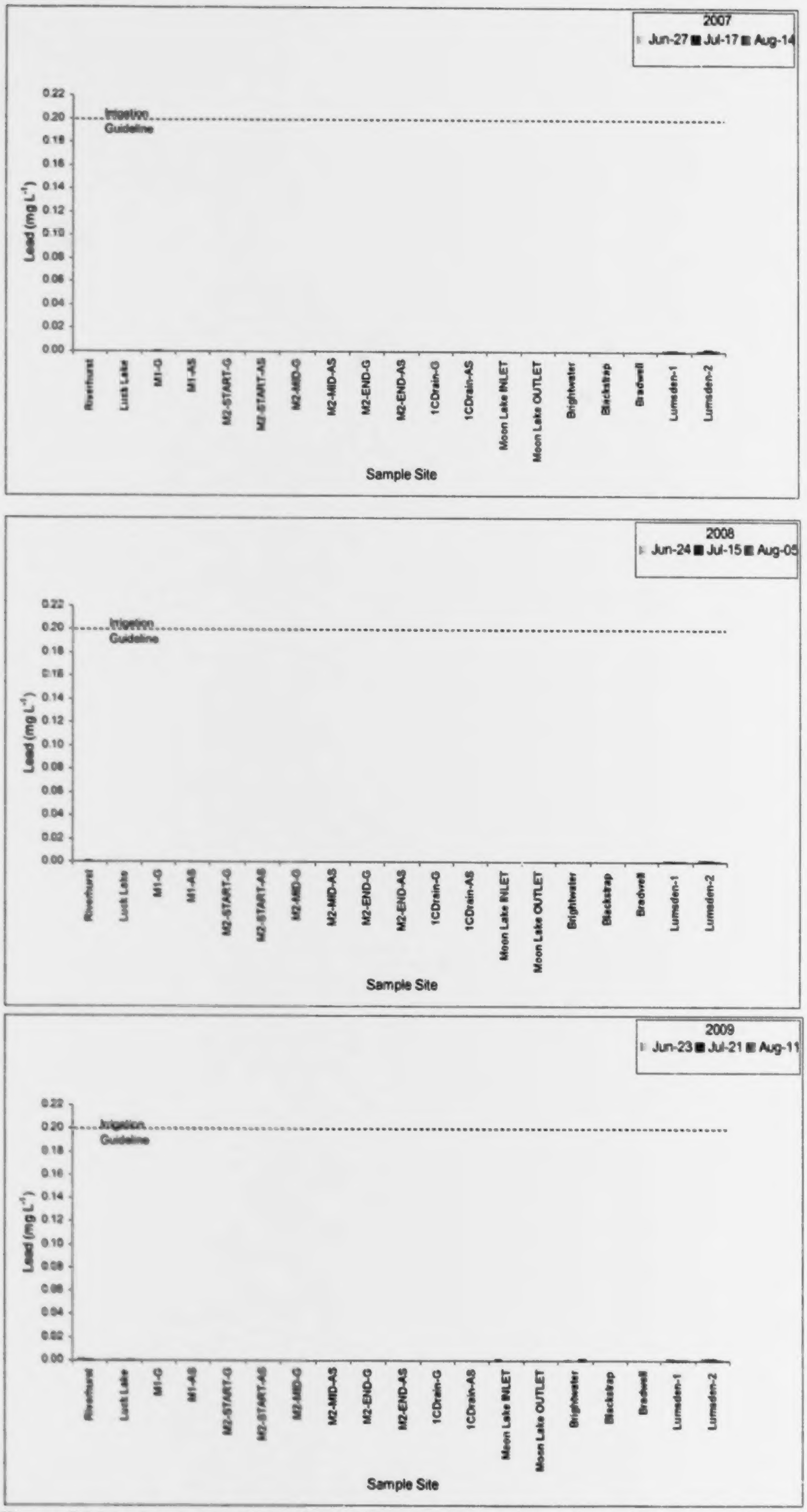


Figure 31.Lead concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

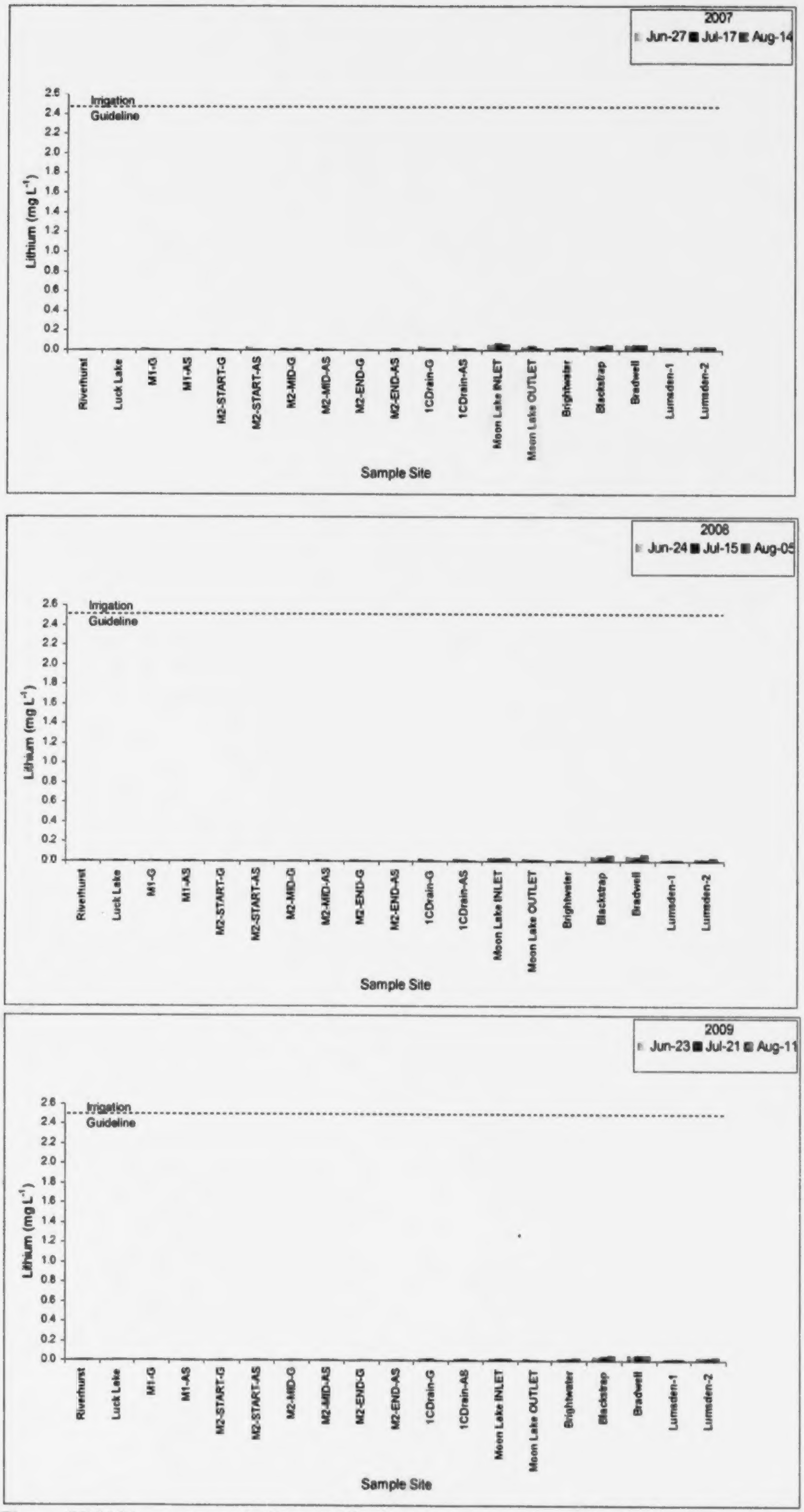


Figure 32.Lithium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

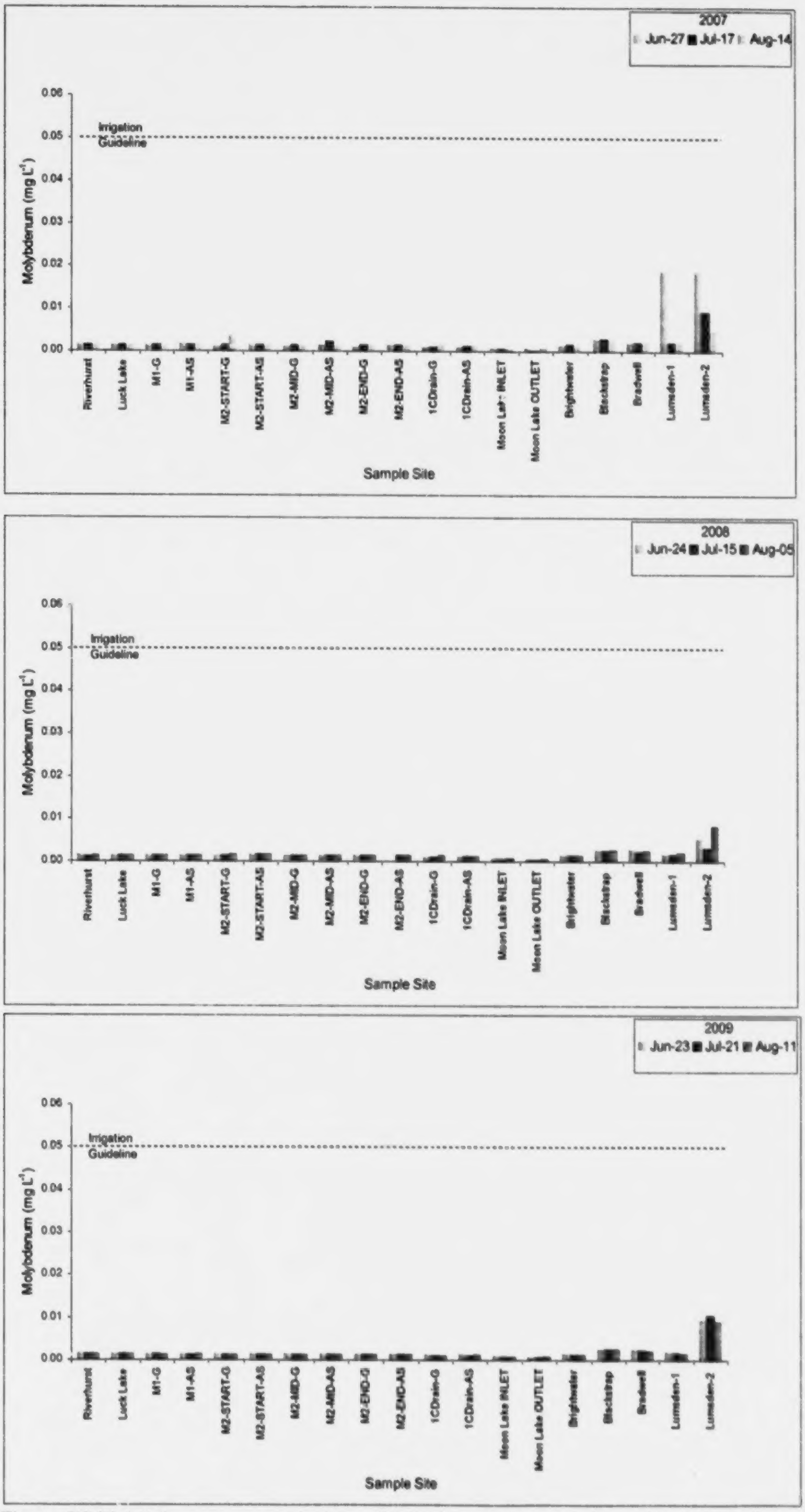


Figure 33.Molybdenum concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

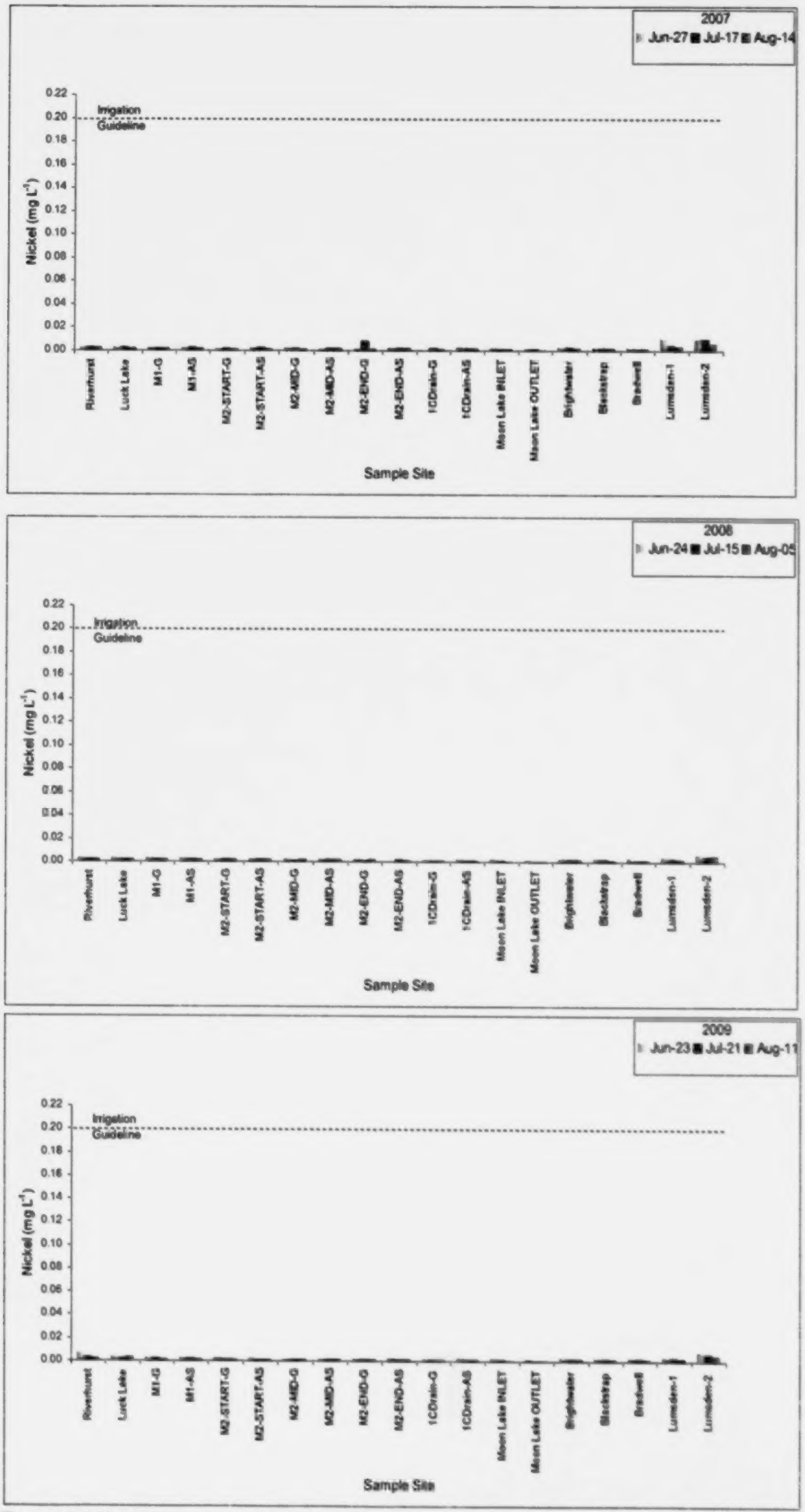


Figure 34.Nickel concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

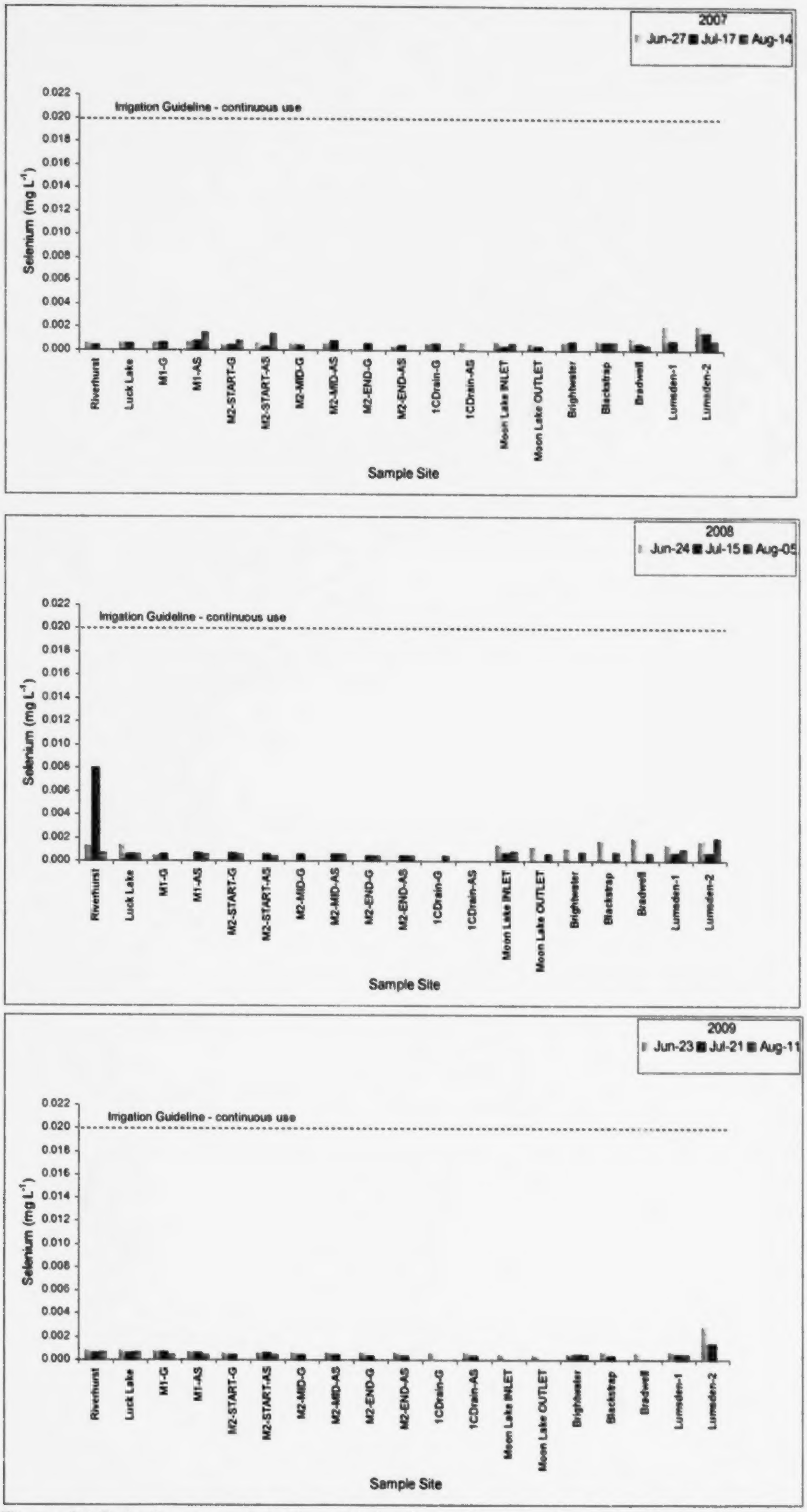


Figure 35.Selenium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

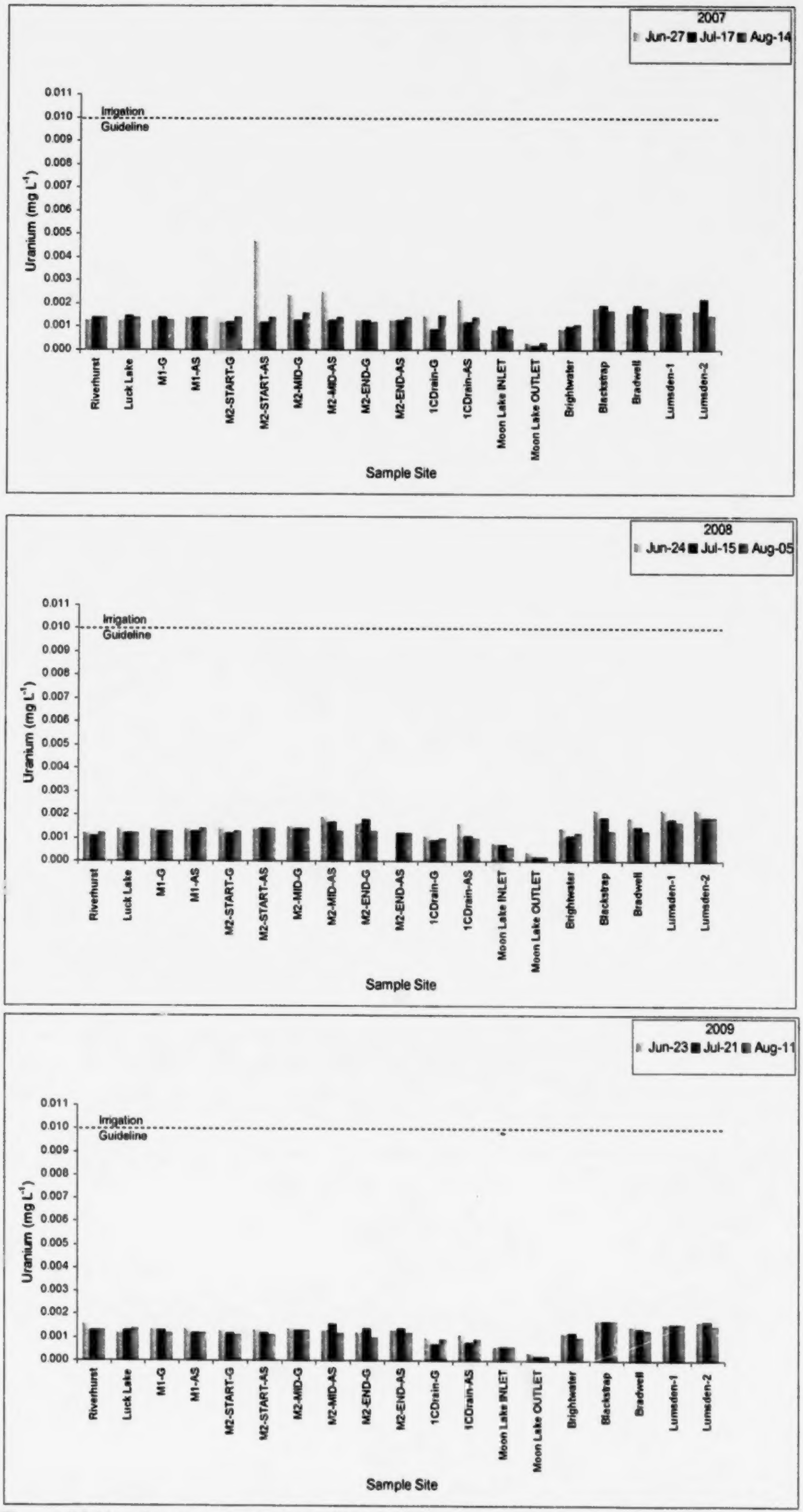


Figure 36.Uranium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

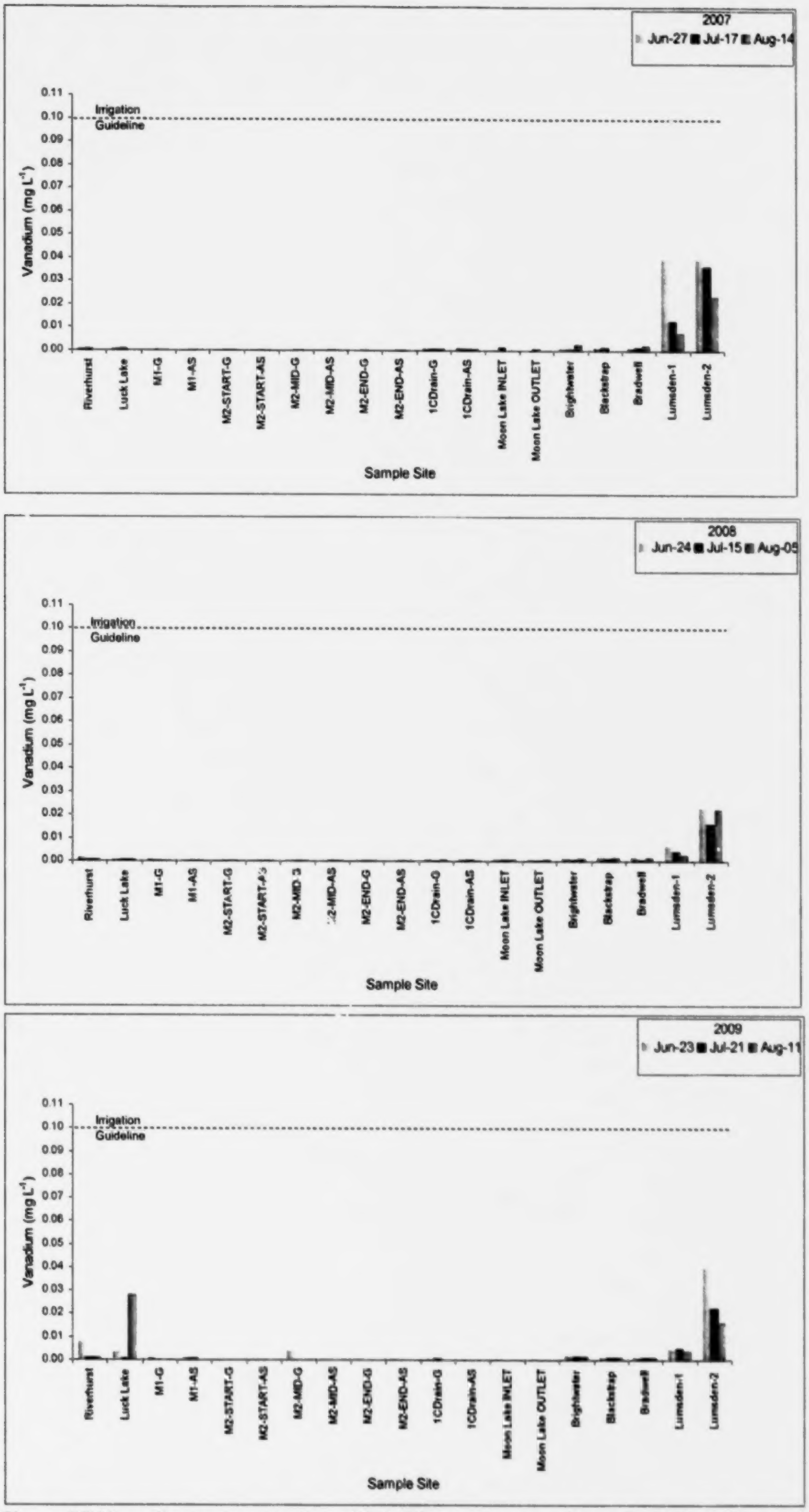


Figure 37.Vanadium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

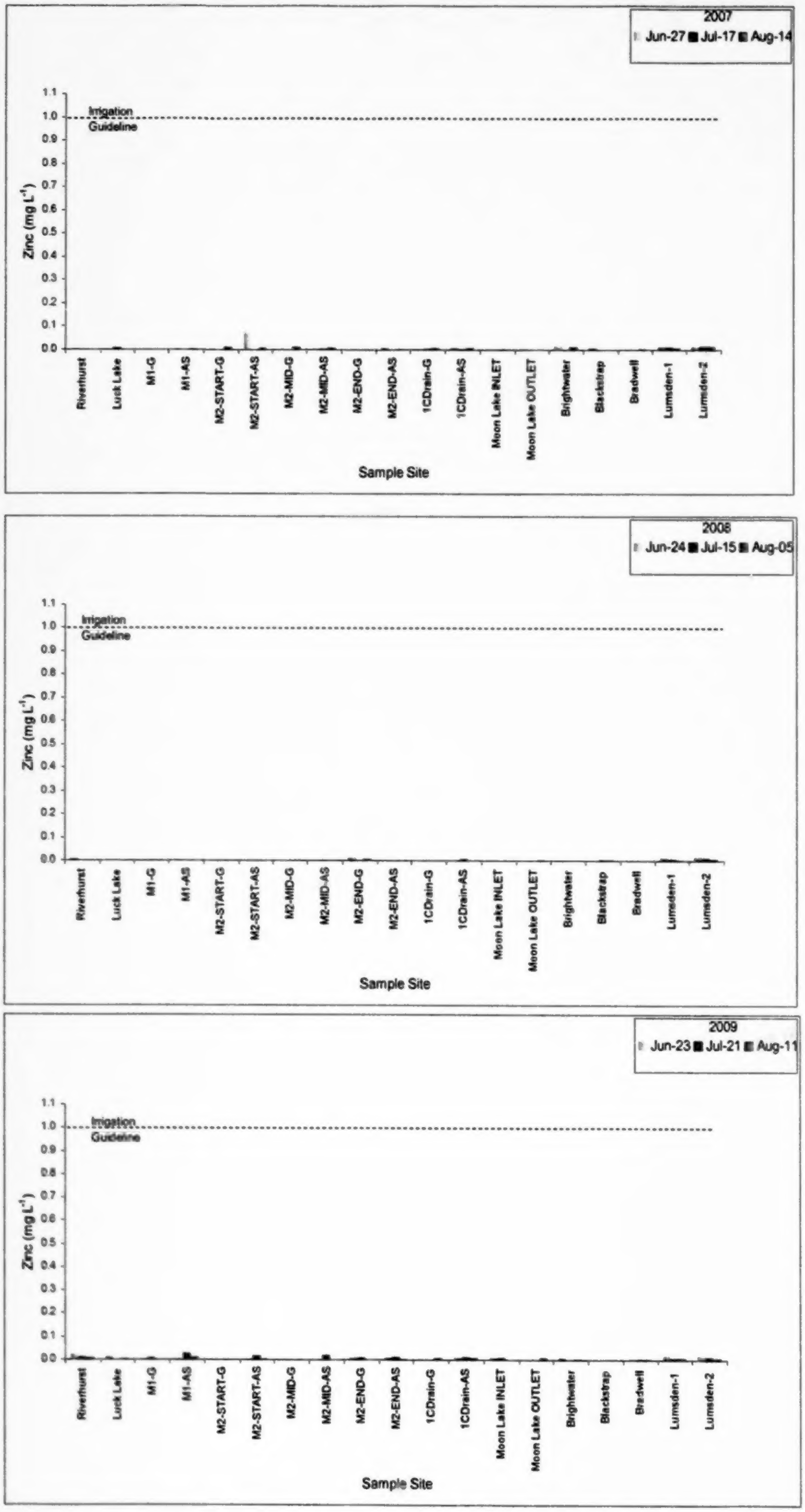


Figure 38.Zinc concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

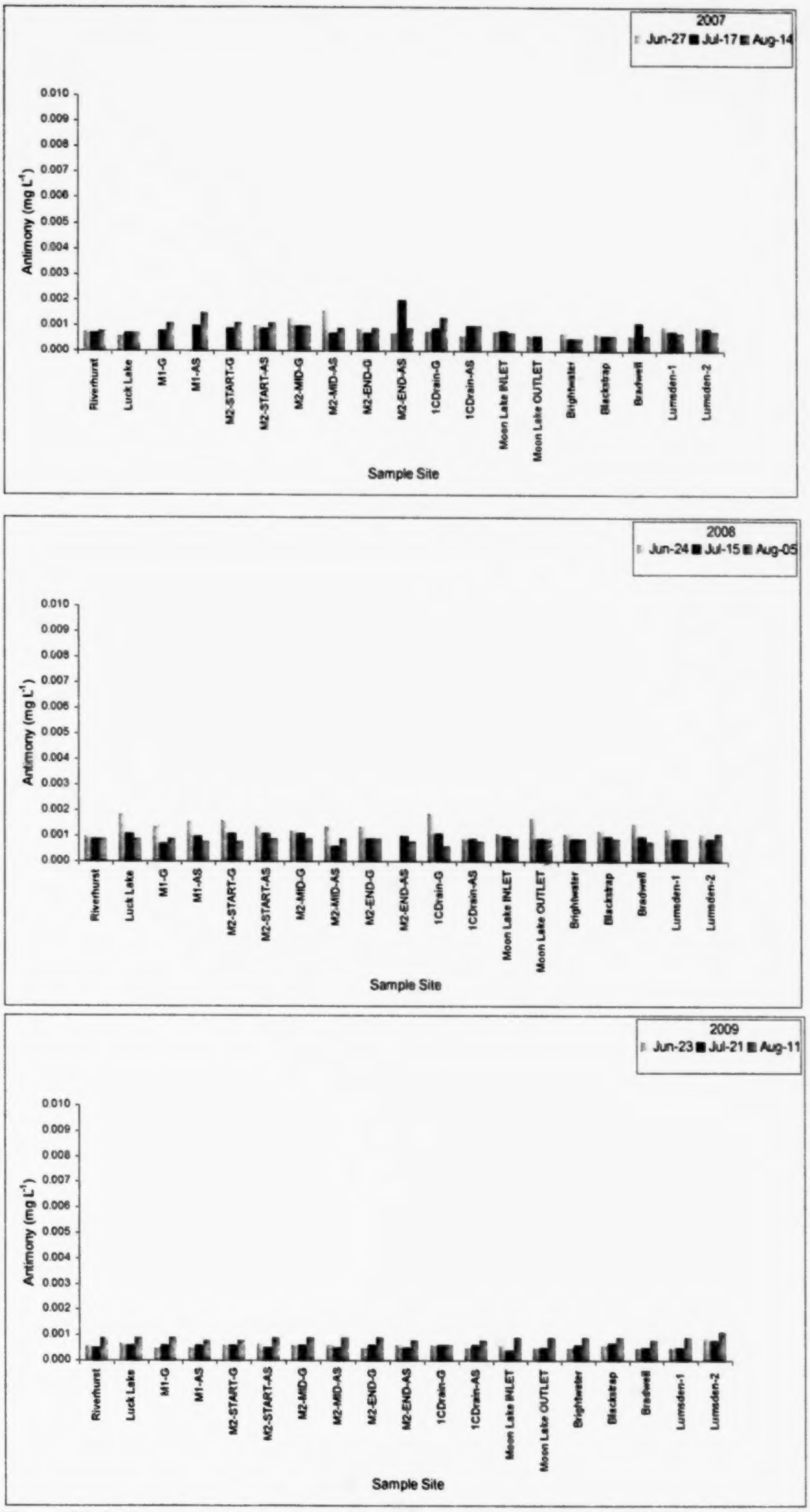


Figure 39.Antimony concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

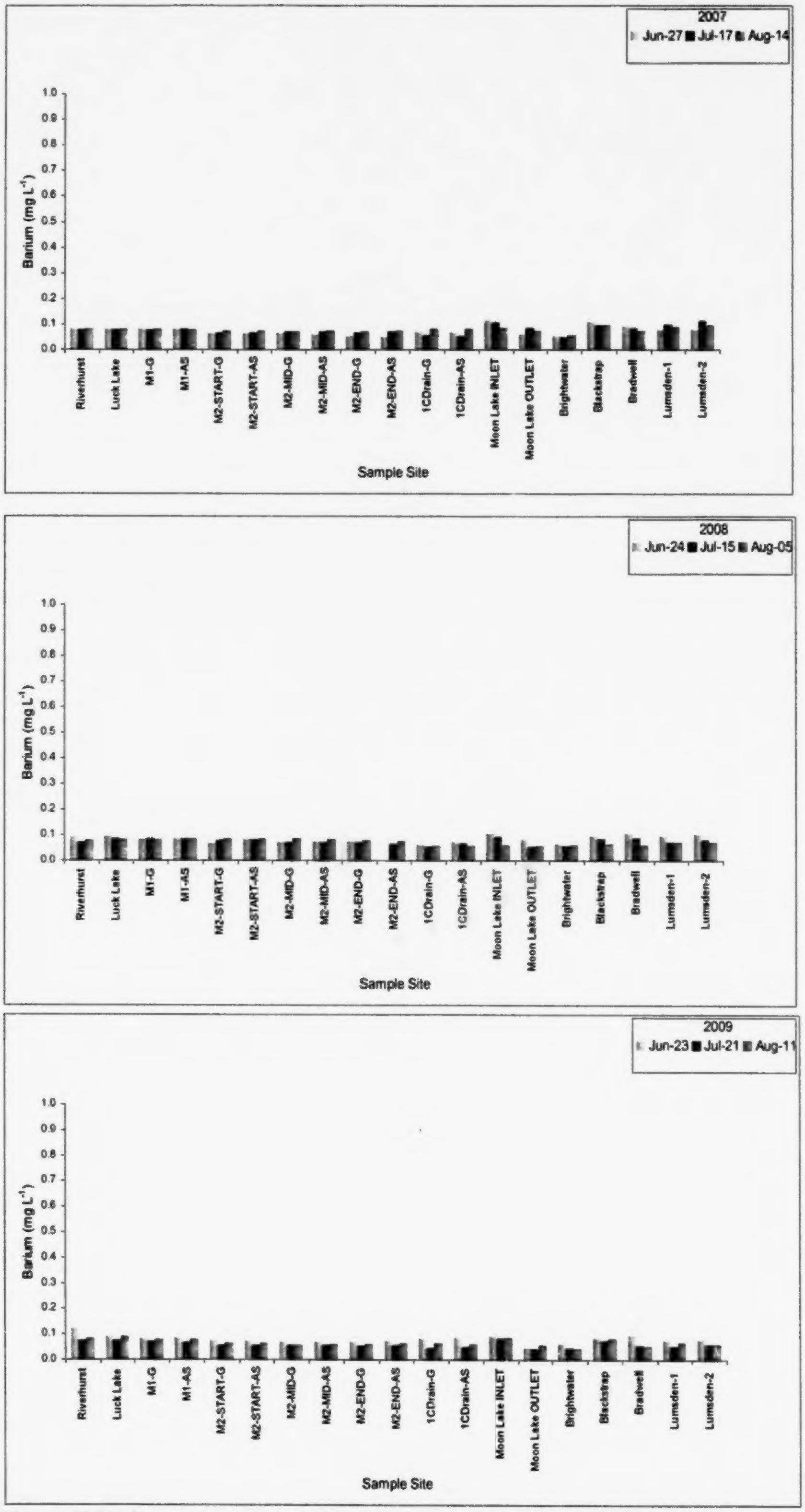


Figure 40.Barium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

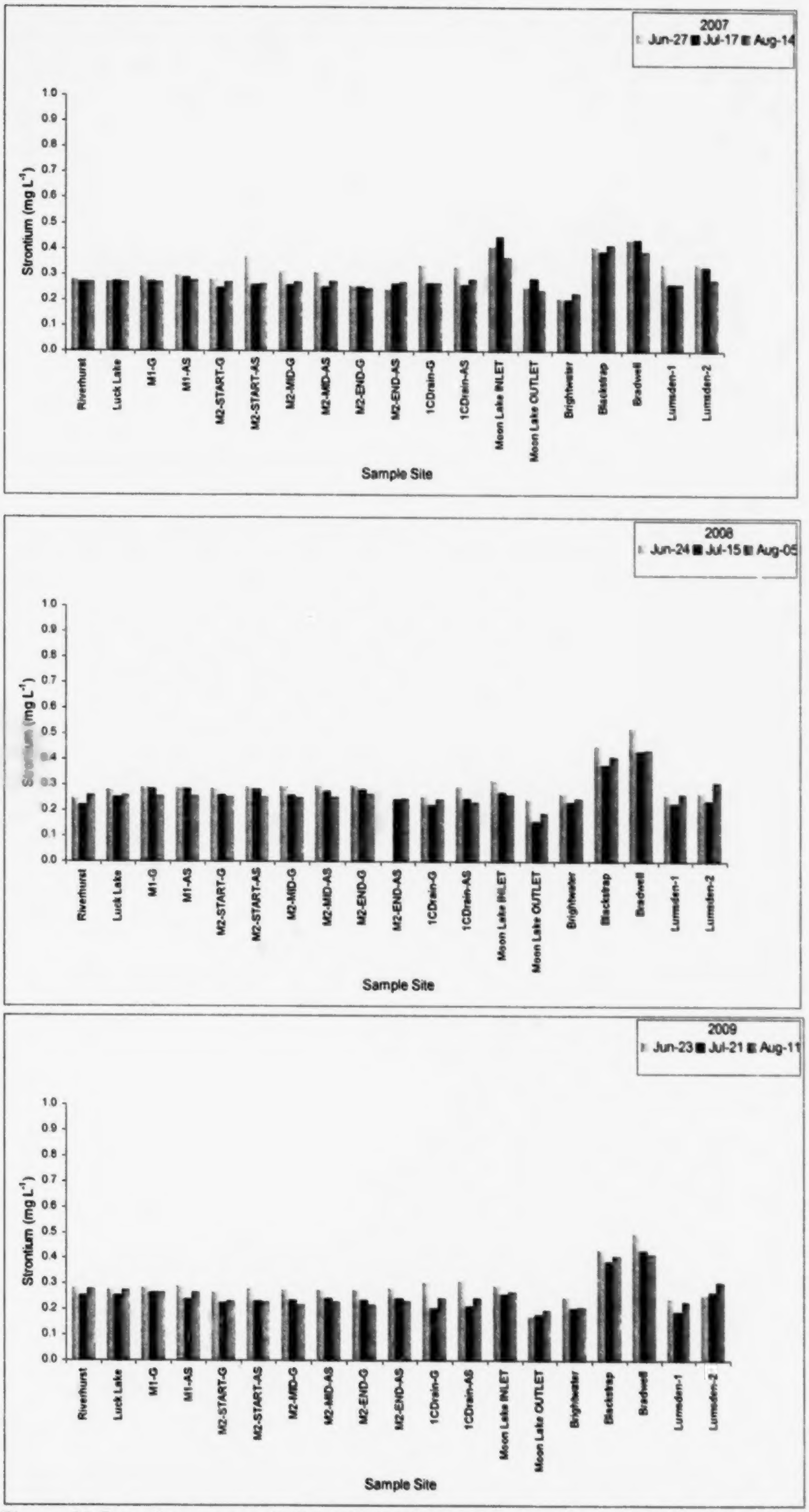


Figure 41. Strontium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

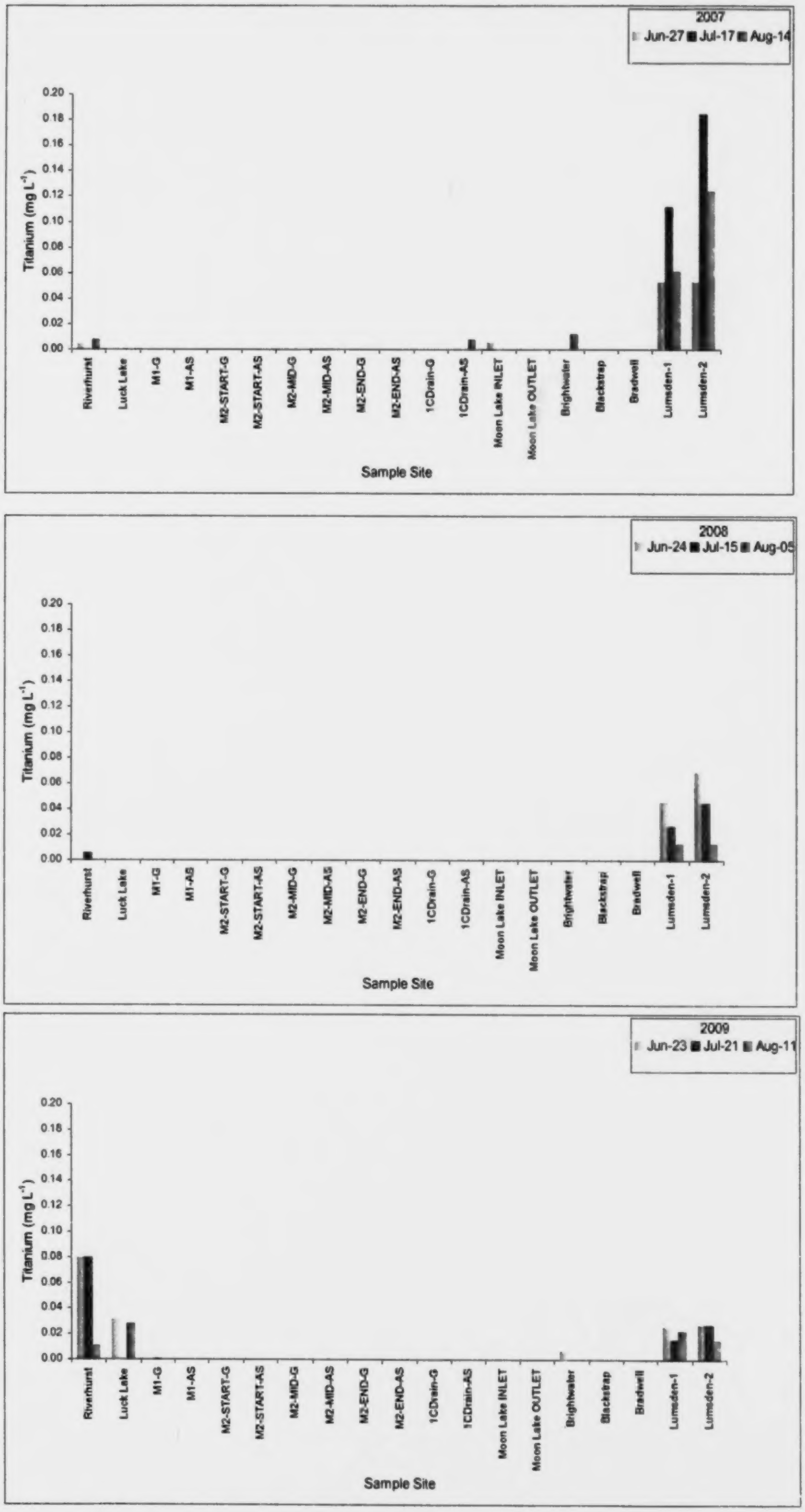


Figure 42.Titanium concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

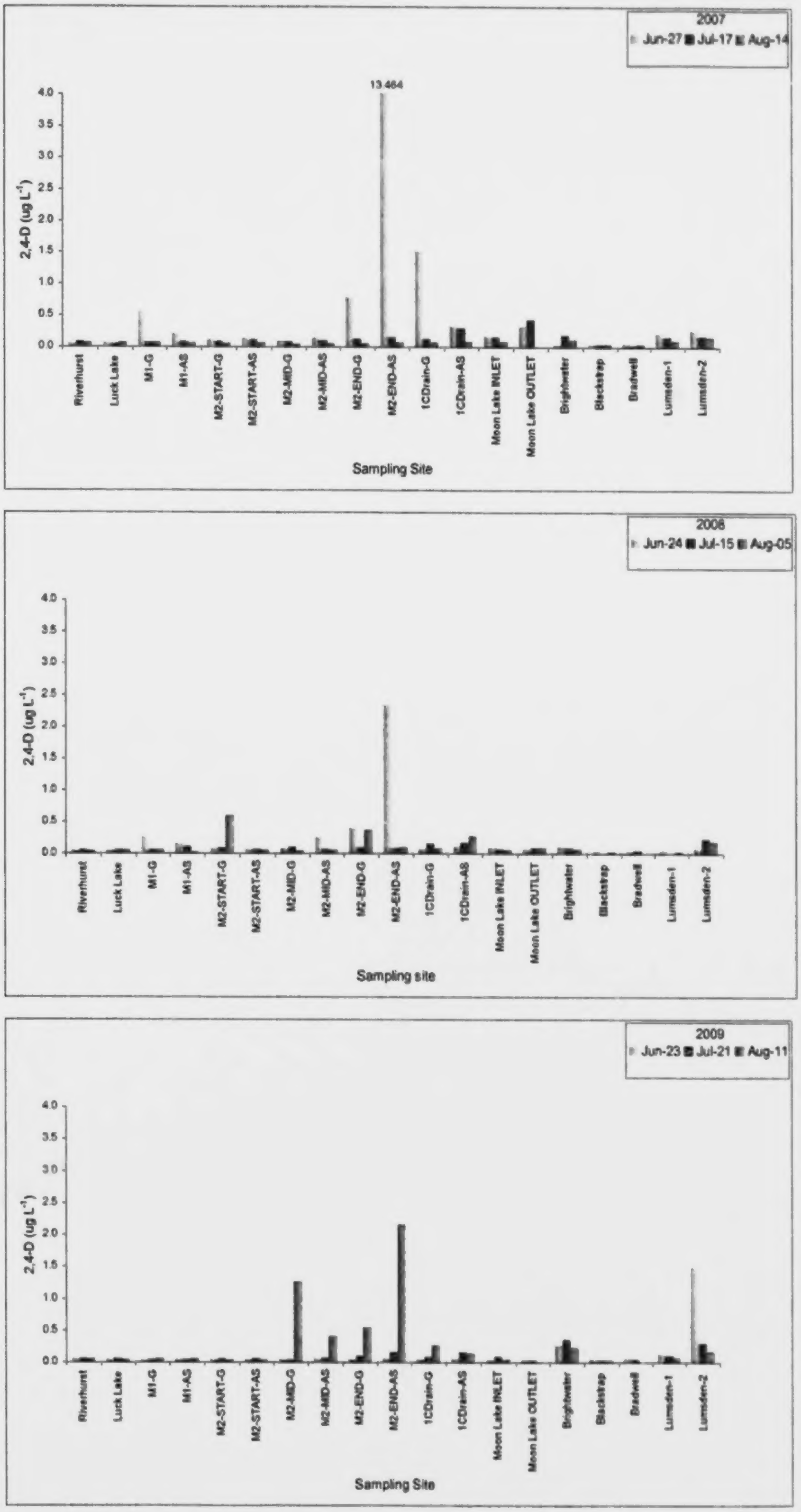


Figure 43. 2,4-D concentration of irrigation water samples collected at all sampling sites for the three year period from 2007-2009.

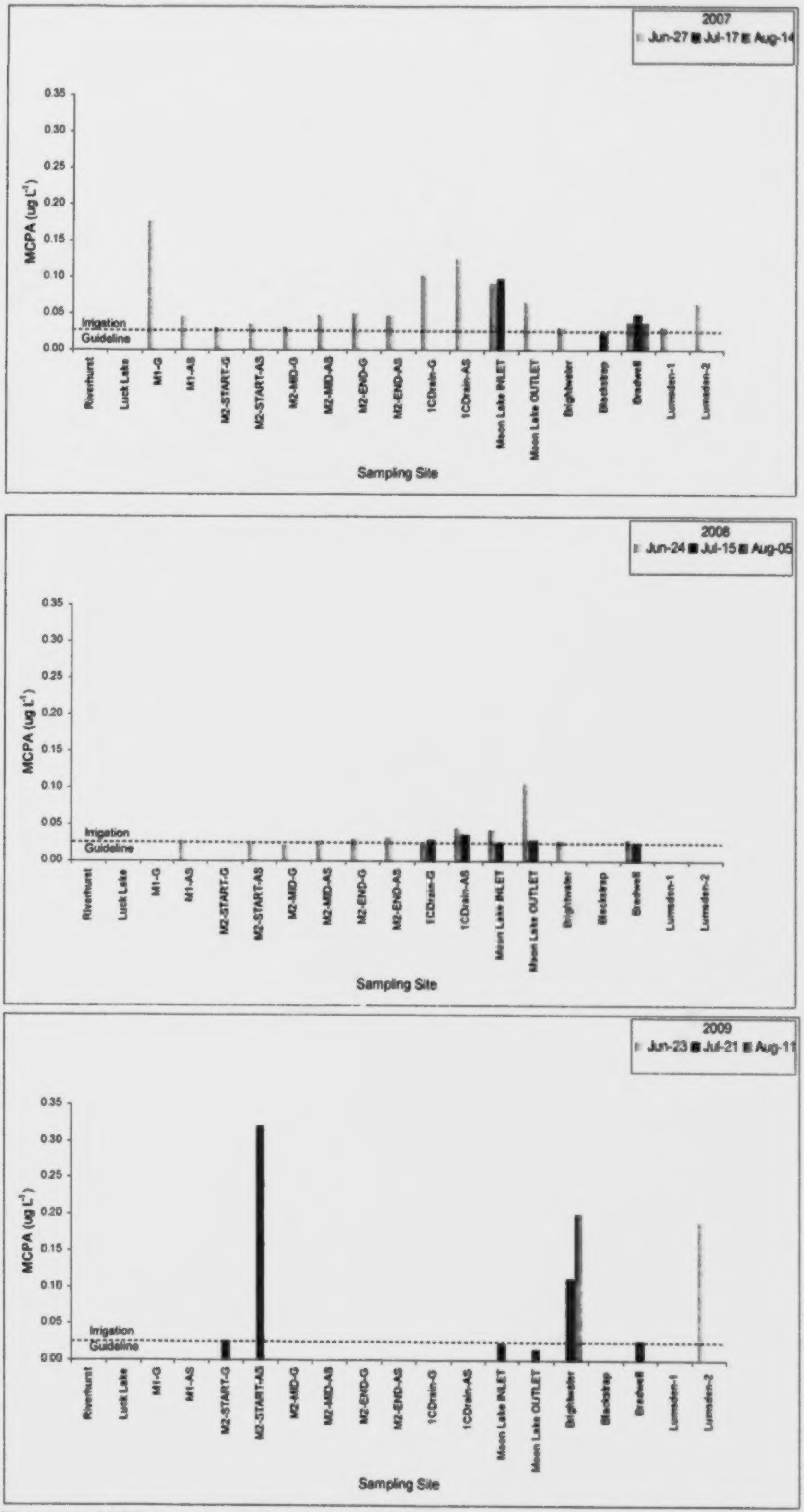


Figure 44.MCPA concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

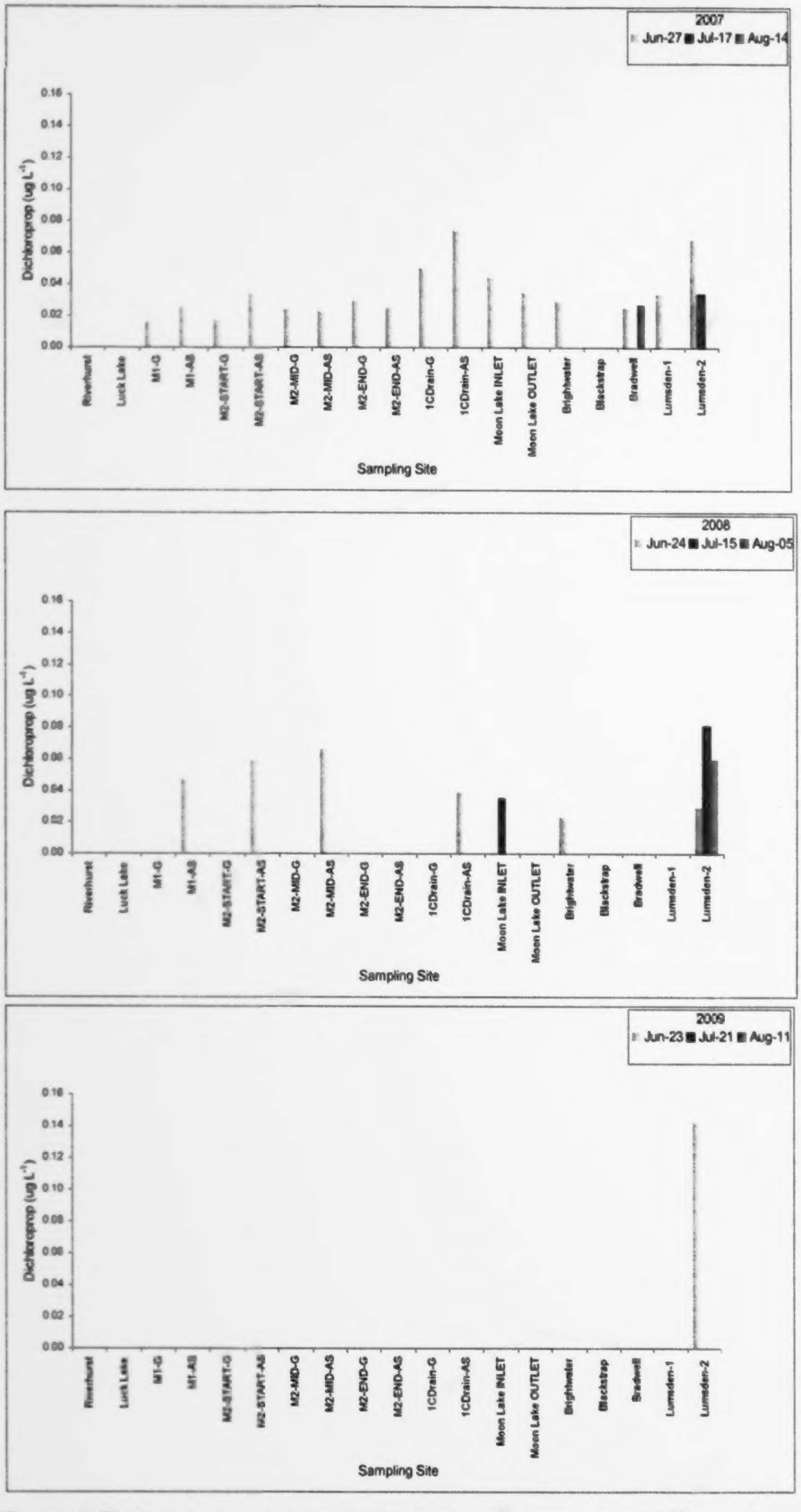


Figure 45.Dichloroprop concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

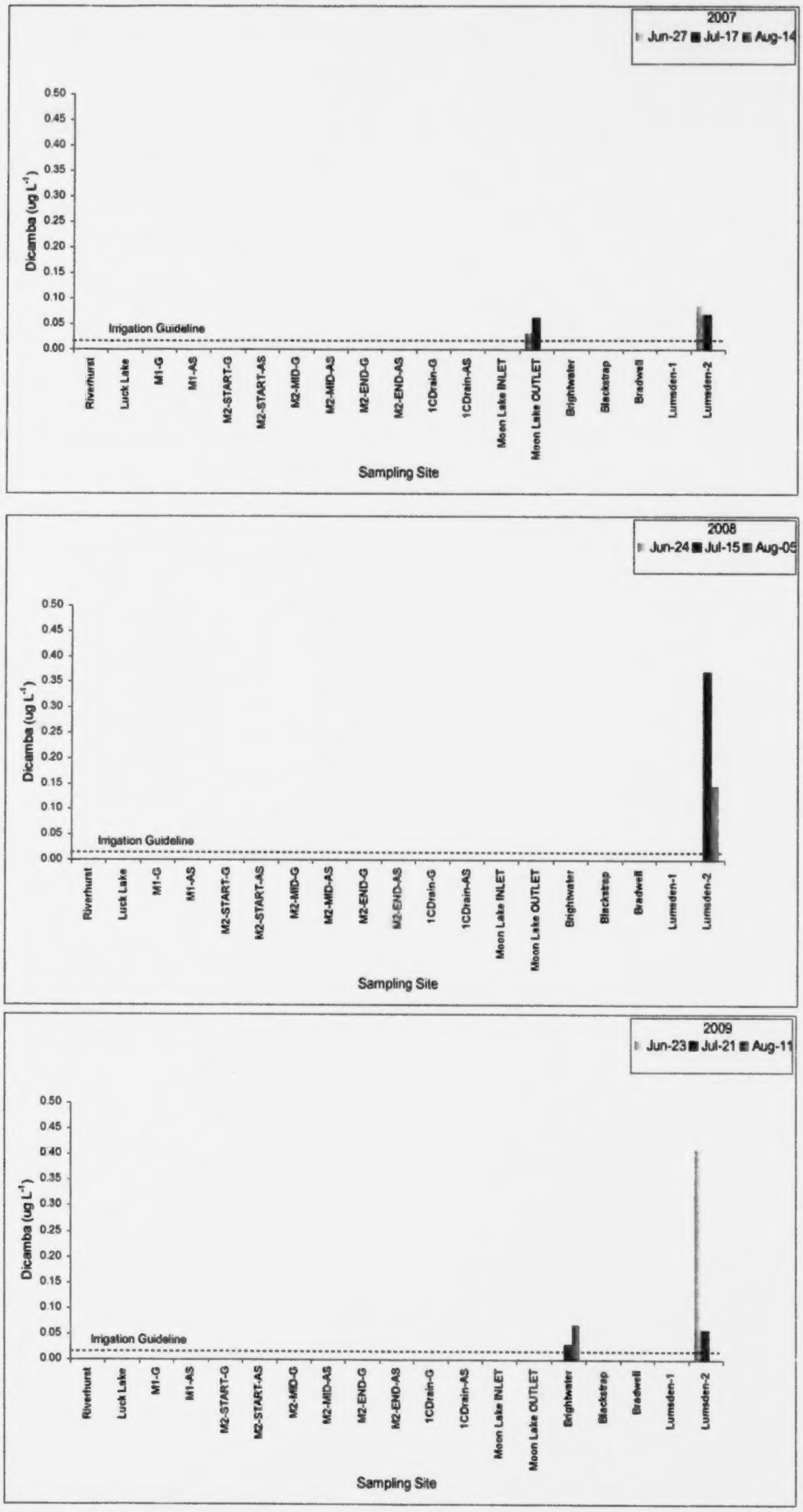


Figure 46.Dicamba concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

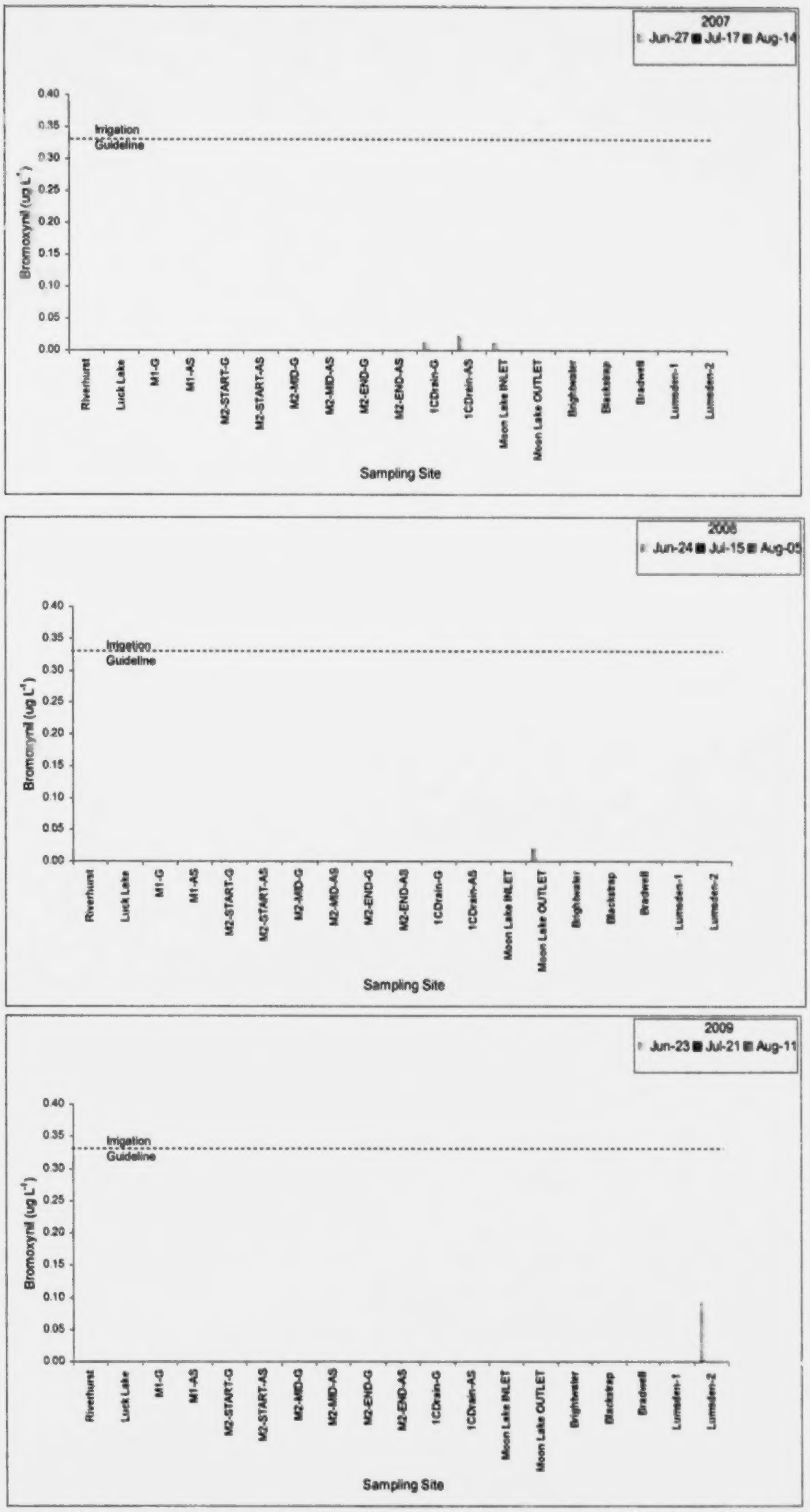


Figure 47.Bromoxynil concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

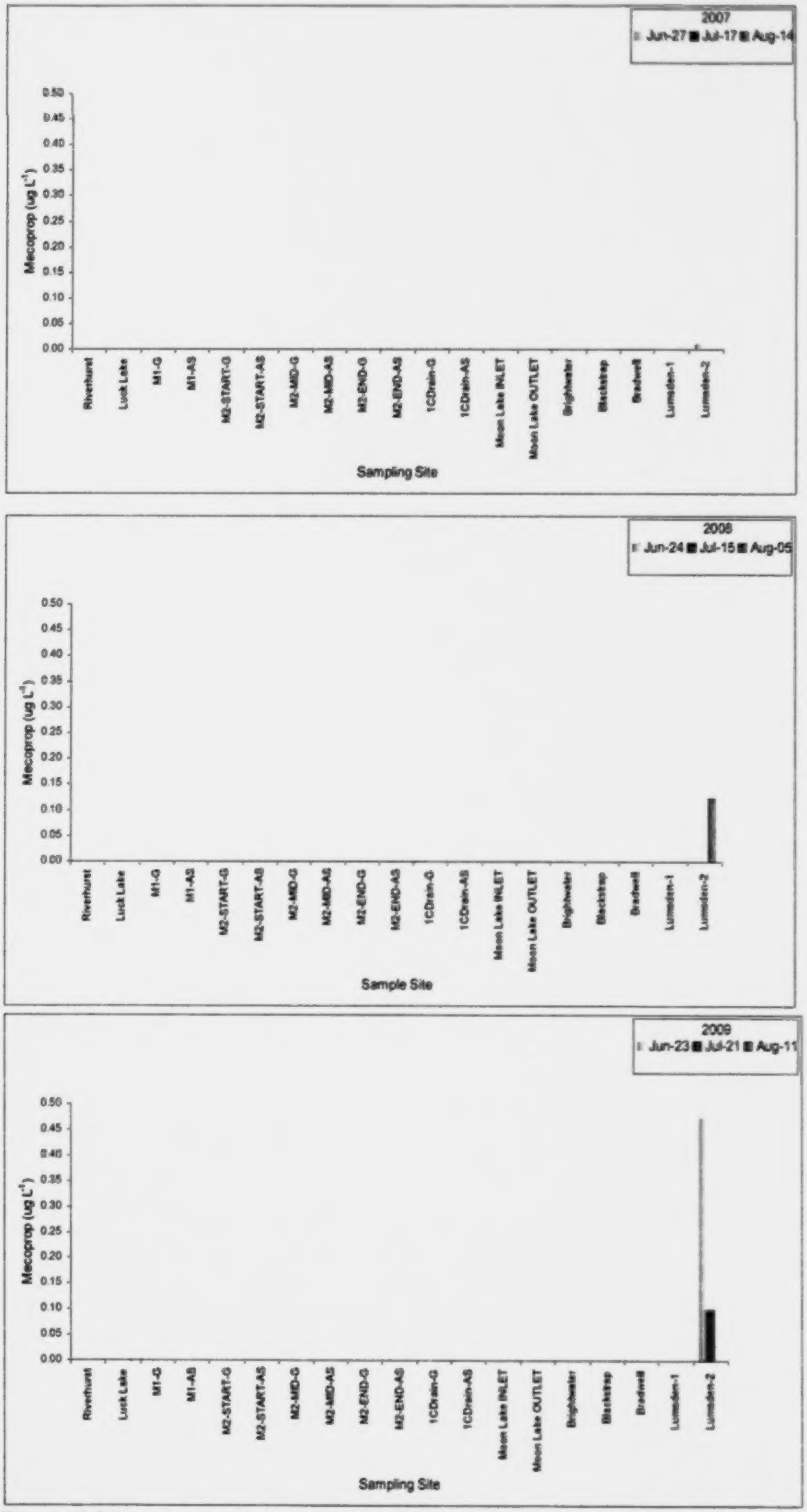


Figure 48.Mecoprop concentration of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

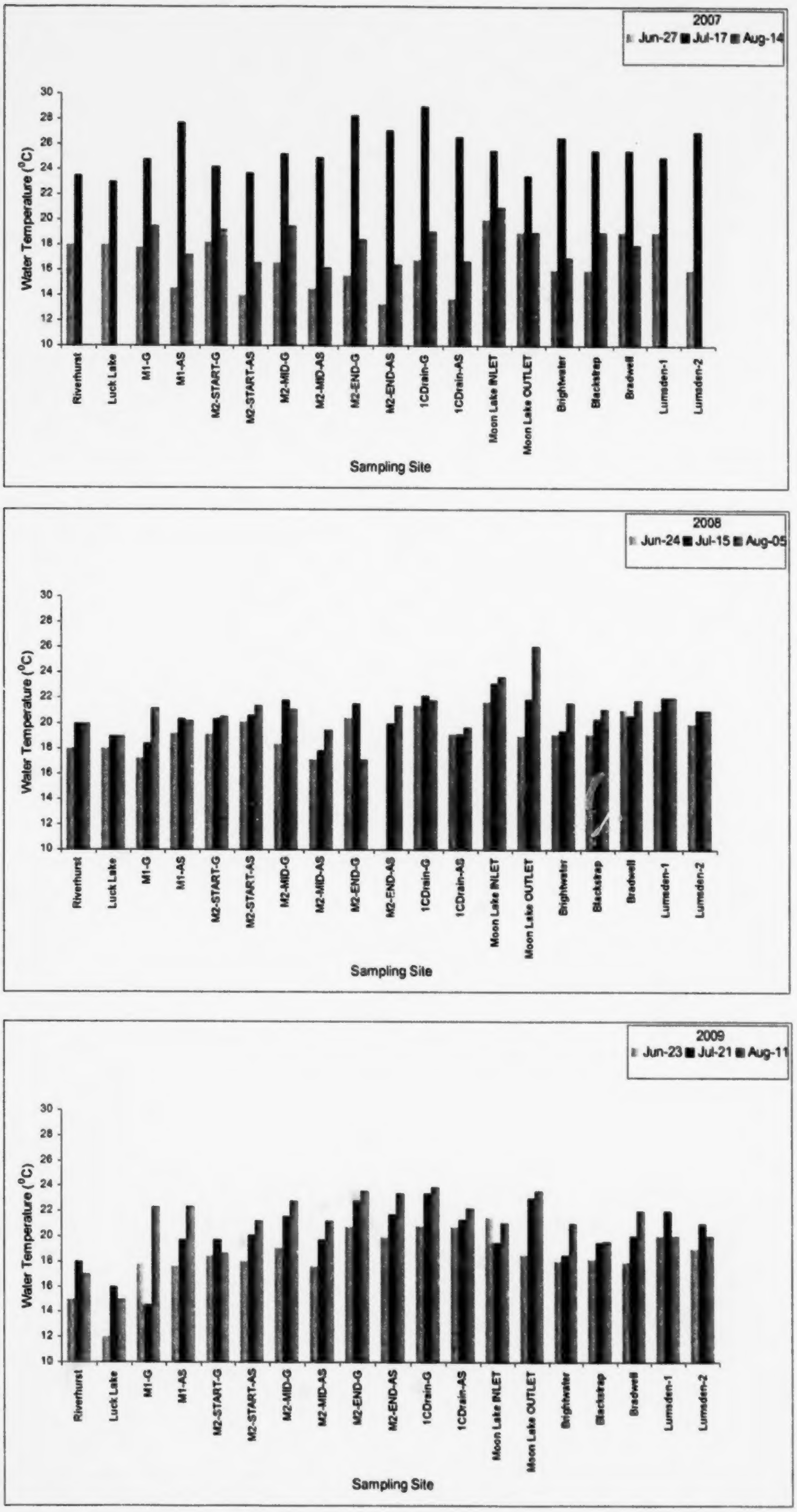


Figure 49.Temperature of irrigation water samples collected at all sampling sites for the three year period 2007-2009.

Appendix 1

Sampling Protocol

Appendix 1

CSIDC Irrigation Water Quality Project Sampling Protocol

Material Check List

1. Coolers with ice packs
2. Thermometer
3. Disposable rubber gloves
4. Permanent maker for labels
5. Packing tape
6. Sampler with extending handle and sample collector bottle
7. Filter paper
8. Funnels
9. Field maps
10. Camera
11. Field note binder
12. Distilled water
13. GPS unit
14. Bottles for samples – 6 for each site:
    - (i) Metals 250 ml P.E.T.E. (widemouth) plus a vial of 5 ml 20% nitric acid preservative – Blue
    - (ii) Nutrients 500 ml Polyethylene plus a vial of 2 ml 1:1 H_2SO_4 preservative – Purple
    - (iii) Nutrients no preservative 250 ml Amber Glass (wrapped in bubble wrap)
    - (iv) Routine no preservative 500 ml Polyethylene
    - (v) Bacteriological 250 ml Sterilized Plastic (bottle contains sodium thiosulfate preservative)
    - (vi) Pesticides 1000 ml Amber Glass with aluminum foil lid liner (wrapped in bubble wrap)

Water Sampling Procedure

Always sample in the same location. When possible, sample off of a safe and secure structure mid-channel and about mid-depth. If there is a road near the sampling location, sample on the upstream side to avoid dust contamination.

With the sampling container attached to the extension pole dip into the water and **rinse the container 3x**. Collect water with the sampling container. Record temperature of water in the field note binder.

(i) Metals 250 ml P.E.T.E. (widemouth) plus a vial of 5 ml 20% nitric acid preservative – Blue (1)
Rinse bottle 3x and then fill to shoulder of the bottle. Add preservative (metal blue #1 with 5 ml 20% nitric acid).

(ii) Nutrients 500 ml Polyethylene plus a vial of 2 ml 1:1 H_2SO_4 preservative – Purple (2)
Rinse bottle 3x and then fill to shoulder of the bottle. Add preservative as required (nutrient purple #2 with 2 ml 1:1 H_2SO_4). Wrap the glass nutrient unpreserved bottle in bubble wrap before placing in cooler.

(iii) Nutrients no preservative 250 ml Amber Glass (wrapped in bubble wrap)
Rinse bottle 3x and then fill to shoulder of the bottle. **No preservative required.** Wrap the glass nutrient unpreserved bottle in bubble wrap before placing in cooler.

(iv) Routine no preservative 500 ml Polyethylene
Rinse bottle 3x and then fill to shoulder of the bottle. **No preservative required.**

(v) Bacteriological 250 ml Sterilized Plastic (bottle contains sodium thiosulfate preservative)
Do not rinse the Bacteriological bottle because it already contains preservative. Fill it from the sampling container up to the top of the label.

(vi) Pesticides 1000 ml Amber Glass with aluminum foil lid liner (wrapped in bubble wrap)
Do not rinse the pesticide bottle. After the site information is recorded on the label cover with clear packing tape to prevent the ink from smearing. Fill the 1000 ml pesticide amber glass bottle from the sampling container. Place the aluminum foil liner on top of the bottle and close with the screw cap. Wrap bottle in bubble wrap before placing back in cooler. The bubble wrap should be folded under the bottle as well as a protection for the bottom of the bottle.

Place all samples in cooler with ice to keep temperature at 4^0 C.

NOTE: After all sampling has been completed at each site rinse the water sampling container with distilled water.

Labelling and Field Notes

Ensure all samples are affixed with appropriate labels that include site designation, date and sampling time with a permanent marker. As well, fill in field data sheets at the site and include observations such as field spraying and other activity near the sampling site.

Record location of sample: close to shore, middle of stream, close to surface, depth below surface.

GPS coordinates should be recorded for each sampling site. Record Latitude and Longitude readings.

Turbidity Scale

Record the turbidity of the water at each sampling site using the following scale:

1	Clear – can read a newspaper under water
2	Low turbidity – can see bottom of stream but not clearly
3	Moderately turbid – cannot see bottom of stream
4	Highly turbid – can only see part of bottle under water
5	Very turbid – cannot see beyond surface of water

Appendix 2

Methodology

Appendix 2

Nutrient, chemical, bacteria and metal analysis in water

Total Alkalinity: Alkalinity was determined by titration of an aliquot with standardized acid solution to a pH of 4.5. Total alkalinity, bicarbonate, carbonate (if present) and hydroxide (if present) also reported (Greenberg et al. 1992 – Method 2320B).

Chloride: Chloride in the extract was determined colorimetrically at 660 nm by complexation with mercury (II) thiocyanate. In the colorimetric method, chloride (Cl^-) displaces thiocyanate which, in the presence of ferric iron, forms a highly colored ferric thiocyanate complex (Greenberg et al. 1992 – Method 4500Cl-E).

Cations: Cations were determined directly by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) (Greenberg et al. 1992 – Method 3120B).

Bacteria 2007: A sample of water was filtered through a membrane filter. The filter was placed on a selective broth. After incubation, the colonies were counted and confirmed. Results are reported as CPU/100 ml (Greenberg et al. 1992 - Method 9221A-C).

Bacteria 2008: Coliform bacteria was determined by Most Probable Number (MPN) to endpoint analysis. Results are reported as MPN/100 ml. (Celesceri et al. 1998 - Method 9221A-C)

Total Mercury (Hg): Method EPA 245.7/EPA 245.1.

Total Trace Metals: Method EPA 6020.

Total Major Metals: Method EPA 200.7.

Total Kjeldhal Nitrogen: Method APHA 4500N-C – Digest, Autocolorimetry.

Nitrate, Nitrite and Nitrate+Nitrite-N: Nitrate was quantitatively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite (reduced nitrate + original nitrite) was then determined by diazotizing with sulfanilamide followed by coupling with N-(1-napthyl) ethylenediamide dihydrochloride. The resulting water-soluble dye has a magenta color, which was measured at 520 nm. Original nitrite could also be determined by removing the cadmium column and following the same procedure (Greenberg et al. 1992 – Method 4500NO3-F).

Ammonia-N: Ammonium in the sample was mixed with hypochlorite and salicylate to form a substituted indophenol blue, which was intensified with sodium nitroprisside and determined colorimetrically at 660 nm by auto analysis (Greenberg et al. 1992 – Method 4500 NH3-G).

Total Phosphorus: During the digestion procedure, the sample was heated in the presence of sulfuric acid, K_2SO_4 and $HgSO_4$ for two and a half hours. With mercuric oxide as a catalyst, the phosphorus in the sample was converted to the orthophosphate ion. Potassium sulfate was also added to raise the boiling temperature of the digestion and speed the conversion to orthophosphate. The orthophosphate ion (PO_4^{-3}) in the digested sample reacts with ammonium molybdate and antimony potassium tartrate to form an antimony-phosphomolybdate complex. This complex was reduced with ascorbic acid to form an intense blue color which was read at 880 nm. The absorbance is proportional to the concentration of orthophosphate in the sample (Clesceri et al. 1989 – Method 4500P-C; Digestion method EPA 365.4).

Orthophosphate (PO_4-P): The orthophosphate ion (PO_4^{-3}) in the digested sample reacts with ammonium molybdate and antimony potassium tartrate to form an antimony-phosphomolybdate complex. This complex was reduced with ascorbic acid to form an intense blue color which was read at 880 nm. The absorbance is proportional to the concentration of orthophosphate in the sample (Clesceri et al. 1989 – Method 4500P-C).

Total Suspended Solids: A well mixed sample was filtered through a weighed filter and the residue retained on the filter was dried to a constant weight at 103°C - 105°C. The increase in weight of the filter represents the total suspended solids (Greenberg et al 1992 – Method 2540D).

GC-MS analytical method used for pesticide analysis in water

Water samples were analyzed for eighteen herbicides (2,4-D, 2,4-DB, atrazine, bromacil, bromoxynil, clopyralid, dicamba, dichlorprop, diclofop-methyl, ethalfluralin, fenoxaprop, imazethapyr, MCPA, mecoprop, picloram, quinclorac, trifluralin, triallate) and ten insecticides (aldrin, chlorpyrifos, DDE – "op" & "pp", dieldrin, dimethoate, heptachlor, heptachlor-epoxide, lindane and methoxychlor). The LRC analytical method was adapted from Bruns et al. (1991) and Hill et al. (2002). Briefly, samples were filtered through glass wool, acidified with concentrated sulfuric acid to pH 2 and extracted by liquid-liquid partitioning with dichloromethane. Extracts were then dried with acidified Na_2SO_4, concentrated, methylated using diazomethane, transferred to hexane and adjusted to a final volume of 10 mL.

Esterified extracts were analyzed (2uL injections) using a Hewlett Packard (HP) 6890 Series GC with a HP 5973 mass selective detector (MSD) in selected ion monitoring mode. The column was PAS-1701 (30 m ×1.25 mm i.d., 0.25 um film thickness, ECD-tested 1701 Siloxane). Temperature programming was: 120°C for 2 min, ramped at 20°C/min to 160°C, held for 10 min, ramped at 10°C/min to 170°C, held for 6 min, ramped at 30°C/min to 265°C and held for 10 min. Total analysis time was 34.2 min. The ratio of four fragments ions to each other was determined for each detection, compared with the ratio of those ions in a standard, and only those with Q values greater than 80% (Q = a HP calculated confidence level where ratios must be at least 80% of expected) were accepted as positive pesticide detections. The minimum quantifiable limit was 0.025 ug for all pesticides. Detections below these limits were outside the range of the external standard curve and were assigned values of zero (none detected). Method blanks were run with each set of irrigation water samples analyzed.

References

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Appendix 3

2007 Water Quality Data

Appendix Table 3.1. 2007 Water Quality Analyses – Riverhurst Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	—	0.05	<0.05	0.06	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	—	0.5	0.5	<0.1	0.5
Nitrite-N (NO_2-N)	mg L^{-1}	—	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	—	0.2	0.3	0.4	0.3
Total P	mg L^{-1}	—	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	—	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	—	1	49	44	44
Magnesium (Mg)	mg L^{-1}	—	0.1	18	16	17
Sodium (Na)	mg L^{-1}	—	1	27	24	25
Potassium (K)	mg L^{-1}	—	0.1	4	4	4
Chloride (Cl)	mg L^{-1}	100-700[6]	1	10	8	9
Sulfate (SO_4)	mg L^{-1}	—	4	71	59	62
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	—	5	157	154	152
Bicarbonate (HCO_3)	mg L^{-1}	—	5	191	188	185
Hydroxide (OH)	mg L^{-1}	—	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	—	5	<5	<5	<5
pH	pH	—	0.1	8.3	8.2	8.4
Electrical Conductivity	uS cm^{-1}	—	10	450	420	440
Temperature (at sampling)	^{0}C	—	0.1	18.0	23.5	—
Turbidity Rating (1-5)[1]	—	---	—	1	1	1
Total Suspended Solids	mg L^{-1}	–	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	275	247	254
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	—	196	176	180
SAR[4]	—	---	—	0.8	0.8	0.8
Bacteria						
Total Coliforms	MPN/100mL	1000	3	9	25	7
Fecal Coliforms	MPN/100mL	100	3	5	8	18

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = $Ca\ (mg\ L^{-1})*2.5 + Mg\ (mg\ L^{-1})*4.12$

[4] Sodium Adsorption Ratio = $Na^+\ (meq\ L^{-1})/[[Ca^{++}\ (meq\ L^{-1}) + Mg^{++}\ (meq\ L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 3.1 (continued). 2007 Water Quality Analyses – Riverhurst Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.18	0.08	0.08
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0008	0.0007	0.0008
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0008	0.0008	0.0009
Barium (Ba)	mg L^{-1}	—	0.0002	0.0832	0.0777	0.0818
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.03	0.02	0.02
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	0.0013	<0.005
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.002	0.002	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	0.189	0.056	0.072
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.011	0.008	0.01
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.006	0.003	0.004
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.0002	0.0002	0.0004
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0014	0.0015
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0031	0.0028	0.0028
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0007	0.0005	<0.0004
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.281	0.27	0.272
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	0.005	<0.005	0.008
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0013	0.0014	0.0014
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0007	0.0008	<0.001
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.004	<0.004	<0.004

Appendix Table 3.1 (continued). 2007 Water Quality Analyses – Riverhurst Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.0602	0.0837	0.0668
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 3.2. 2007 Water Quality Analyses – Luck Lake Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	**<0.05**	**<0.05**	**<0.05**
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	**0.45**	**<0.1**	**0.3**
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	**<0.05**	**<0.05**	**<0.05**
Total Kjeldahl N	mg L^{-1}	---	0.2	**0.4**	**0.4**	**0.3**
Total P	mg L^{-1}	---	0.2	**<0.2**	**<0.2**	**<0.2**
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	**<0.02**	**<0.02**	**<0.02**
Calcium (Ca)	mg L^{-1}	---	1	**49**	**46**	**44**
Magnesium (Mg)	mg L^{-1}	---	0.1	**18**	**17**	**17**
Sodium (Na)	mg L^{-1}	---	1	**27**	**26**	**28**
Potassium (K)	mg L^{-1}	---	0.1	**4**	**4**	**4**
Chloride (Cl)	mg L^{-1}	100-700[6]	1	**9**	**9**	**9**
Sulfate (SO_4)	mg L^{-1}	---	4	**69**	**65**	**63**
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	159	158	151
Bicarbonate (HCO_3)	mg L^{-1}	---	5	193	193	184
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5
pH	pH	---	0.1	8.4	8.4	8.4
Electrical Conductivity	uS cm^{-1}	---	10	420	420	440
Temperature (at sampling)	^{0}C	---	0.1	18.0	23.0	---
Turbidity Rating (1-5)[1]	---	---	---	1	1	1
Total Suspended Solids	mg L^{-1}	–	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	273	262	255
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	196	185	180
SAR[4]	---	---	---	0.8	0.8	0.9
Bacteria						
Total Coliforms	MPN/100mL	1000	3	**5**	**6**	**<1**
Fecal Coliforms	MPN/100mL	100	3	**<1**	**2**	**7**

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 3.2 (continued). 2009 Water Quality Analyses – Luck Lake Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.14	0.07	0.1
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0006	0.0007	0.0007
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0008	0.0008	0.0009
Barium (Ba)	mg L^{-1}	—	0.0002	0.0822	0.0795	0.082
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.03	0.03	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	0.0017	<0.005
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.002	0.002	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	0.145	0.052	0.077
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.011	0.009	0.011
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.005	0.003	0.005
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.0002	<0.0002	<0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0015	0.0016	0.0015
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0029	0.0028	0.0027
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0007	0.0006	<0.0004
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.273	0.275	0.272
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0013	0.0015	0.0014
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0006	0.0008	<0.001
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	0.009	<0.004

Appendix Table 3.2 (continued). 2007 Water Quality Analyses – Luck Lake Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.0668	0.0556	0.0728
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 3.3. 2007 Water Quality Analyses – M1 Main Canal sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	0.16	<.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.1	<0.1	0.2	0.2	0.2	0.2
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.3	0.3	0.3	0.3	0.3	0.4
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	40	44	45	47	43	43
Magnesium (Mg)	mg L^{-1}	---	0.1	19	19	18	18	18	18
Sodium (Na)	mg L^{-1}	---	1	27	24	27	27	26	27
Potassium (K)	mg L^{-1}	---	0.1	3	3	4	4	4	4
Chloride (Cl)	mg L^{-1}	100-700[6]	1	8	8	10	9	10	10
Sulfate (SO_4)		---	4	76	74	69	71	67	67
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	142	147	159	160	156	158
Bicarbonate (HCO_3)	mg L^{-1}	---	5	173	180	167	195	190	193
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	13	<5	<5	<5
pH	pH	---	0.1	8.2	8.2	8.3	8.3	8.3	8.3
Electrical Conductivity	uS cm^{-1}	---	10	460	460	460	460	460	460
Temperature (at sampling)	^{0}C	---	0.1	17.8	14.6	24.8	27.7	19.5	17.2
Turbidity Rating (1-5)[1]	---	---	---	1	---	2	---	1	---
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	258	260	269	273	262	265
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	178	188	186	191	181	181
SAR[4]	---	---	---	0.9	0.8	0.9	0.8	0.8	0.9
Bacteria									
Total Coliforms	MPN/100mL	1000	3	9	7	3	1	5	2
Fecal Coliforms	MPN/100mL	100	3	6	1	7	1	23	6

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = $Na^+ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 3.3 (continued) 2007 Water Quality Analyses – M1 Main Canal sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.07	0.11	0.04	0.05	<0.02	0.03
Antimony (Sb)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	0.0008	0.001	0.0011	0.0015
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0013	0.0011	0.0009	0.0009	0.0009	0.0009
Barium (Ba)	mg L^{-1}	---	0.0002	0.0803	0.0814	0.0774	0.0813	0.0812	0.0782
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.05	0.03	0.02	0.03	0.03	0.02
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	0.0008	0.0012	0.0013	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	0.002	0.002	0.002	0.001	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	323	0.068	0.032	0.045	0.01	0.02
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	0.0001	0.0008	<0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.015	0.013	0.011	0.011	0.012	0.011
Manganese (Mn)	mg L^{-1}	0.2	0.001	4.67	0.015	0.004	0.004	0.003	0.002
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.0002	<0.0002	0.0003	0.0004	0.0002	<0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0017	0.0016	0.0016	0.0015	0.0017
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0024	0.0023	0.0027	0.0031	0.0022	0.0022
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0007	0.0008	0.0007	0.0009	<0.0004	0.0016
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.292	0.298	0.275	0.289	0.272	0.279
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	0.0002	0.0003	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0013	0.0014	0.0014	0.0014	0.0013	0.0014
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0004	0.0004	0.0005	0.0004	0.0003	0.0003
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	0.005	<0.004	<0.004	<0.004	0.005

Appendix Table 3.3 (continued) 2007 Water Quality Analyses – M1 Main Canal sampling site									
Parameter	**Units**	**Irrigation Guideline^5**	**D.L.^{7}**	**June 26**		**July 17**		**August 14**	
				Grab Sample	**Auto Sampler**	**Grab Sample**	**Auto Sampler**	**Grab Sample**	**Auto Sampler**
Herbicides									
2,4-D	ug L^{-1}	---	0.025	0.5614	0.2209	0.0755	0.0856	0.0675	0.0648
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	0.0161*	0.0256	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.1772	0.0460	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	--	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 3.4. 2007 Water Quality Analyses – M2 Canal START sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.4	0.6	0.4	0.4	0.3	0.4
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	34	49	34	36	35	35
Magnesium (Mg)	mg L^{-1}	---	0.1	19	31	18	18	18	18
Sodium (Na)	mg L^{-1}	---	1	25	37	26	26	26	46
Potassium (K)	mg L^{-1}	---	0.1	4	4	4	4	4	4
Chloride (Cl)	mg L^{-1}	100-700[6]	1	8	8	9	9	10	10
Sulfate (SO_4)	mg L^{-1}	---	4	72	163	71	71	68	68
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	134	139	135	140	140	138
Bicarbonate (HCO_3)	mg L^{-1}	---	5	163	170	164	171	171	168
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
pH	pH	---	0.1	8.1	8.1	8.3	8.1	8.4	8.2
Electrical Conductivity	uS cm^{-1}	---	10	430	620	410	420	420	420
Temperature (at sampling)	^{0}C	---	0.1	18.2	14.0	24.2	23.7	19.2	16.6
Turbidity Rating (1-5)[1]	---	---	---	1	---	3	---	1	---
Total Suspended Solids	mg L^{-1}	–	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	242	375	243	248	245	244
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	163	250	159	164	162	162
SAR[4]	---	---	---	0.8	1.0	0.9	0.9	0.9	1.6
Bacteria									
Total Coliforms	MPN/100mL	1000	3	7	1	1	<1	16	<1
Fecal Coliforms	MPN/100mL	100	3	2	<1	1	<1	18	4

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 3.4 (continued) 2007 Water Quality Analyses – M2 Canal START sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	<0.02	<0.02	0.06	0.05	0.02	0.03
Antimony (Sb)	mg L^{-1}	—	0.0004	<0.0004	0.001	0.0009	0.0009	0.0011	0.0011
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0013	0.0012	0.0012	0.001	0.001	0.0009
Barium (Ba)	mg L^{-1}	—	0.0002	0.0637	0.0651	0.0687	0.0693	0.0746	0.0746
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.02	0.05	0.03	0.03	0.03	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	0.0002	0.0003	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	0.0009	0.002	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	<0.001	0.002	0.001	0.001	0.001	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.089	0.026	0.065	0.035	0.022	0.02
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	<0.0001	0.0002	0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.014	0.035	0.013	0.013	0.011	0.011
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.008	0.029	0.021	0.007	0.007	0.003
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0012	0.0014	0.0015	0.0016	0.0036	0.0015
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0017	0.0021	0.0023	0.0028	0.0019	0.0017
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0005	0.0007	0.0005	0.0004	0.0009	0.0015
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.282	0.371	0.248	0.261	0.269	0.262
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0012	0.0047	0.0012	0.0012	0.0014	0.0014
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0002	0.0003	0.0005	0.0004	0.0002	0.0002
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.005	0.008	<0.004	<0.004	0.011	0.007

Appendix Table 3.4 (continued) 2007 Water Quality Analyses – M2 Canal START sampling site									
Parameter	**Units**	**Irrigation Guideline[5]**	**D.L.[7]**	**June 26**		**July 17**		**August 14**	
				Grab Sample	**Auto Sampler**	**Grab Sample**	**Auto Sampler**	**Grab Sample**	**Auto Sampler**
Herbicides									
2,4-D	ug L^{-1}	---	0.025	0.1241	0.1417	0.0877	0.1081	0.0642	0.0739
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	0.0171*	0.0344	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.0305	0.0355	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	--	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 3.5. 2007 Water Quality Analyses – M2 Canal MID sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	—	0.05	<0.05	<0.05	0.07	0.11	<0.05	0.07
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.5	0.4	0.4	0.4	0.4	0.5
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	44	45	35	36	35	36
Magnesium (Mg)	mg L^{-1}	---	0.1	24	25	19	19	19	19
Sodium (Na)	mg L^{-1}	---	1	29	28	26	27	27	27
Potassium (K)	mg L^{-1}	---	0.1	4	4	4	4	4	4
Chloride (Cl)	mg L^{-1}	100-700[6]	1	9	9	9	10	10	10
Sulfate (SO_4)	mg L^{-1}	---	4	107	111	72	74	74	71
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	139	143	136	135	139	140
Bicarbonate (HCO_3)	mg L^{-1}	---	5	170	174	166	165	169	171
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
pH	pH	---	0.1	8.2	8.1	8.2	8.2	8.3	8.3
Electrical Conductivity	uS cm^{-1}	---	10	530	530	420	420	430	430
Temperature (at sampling)	^{0}C	---	0.1	16.6	14.5	25.2	24.9	19.5	16.2
Turbidity Rating (1-5)[1]	---	---	---	1	---	1	---	1	---
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	300	308	247	251	252	251
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	209	215	166	168	166	168
SAR[4]	---	---	---	0.9	0.8	0.9	0.9	0.9	0.9
Bacteria									
Total Coliforms	MPN/100mL	1000	3	7	15	1	<1	<1	<1
Fecal Coliforms	MPN/100mL	100	3	9	10	1	<1	7	10

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 3.5 (continued) 2007 Water Quality Analyses – M2 Canal MID sampling site									
Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.03	<0.02	0.02	0.04	<0.02	0.03
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0013	0.0016	0.001	0.0007	0.001	0.0009
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0015	0.0017	0.001	0.0011	0.001	0.0011
Barium (Ba)	mg L^{-1}	---	0.0002	0.0631	0.0618	0.0695	0.0703	0.0723	0.0762
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	0.0003
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	0.0014	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	<0.001	0.002	<0.001	0.002	<0.001	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	0.024	0.022	0.02	0.036	0.011	0.026
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.022	0.022	0.013	0.013	0.014	0.013
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.032	0.033	0.011	0.007	0.013	0.005
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0013	0.0015	0.0014	0.0024	0.0014	0.0014
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.002	0.0017	0.0024	0.0026	0.0018	0.002
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0006	0.0006	0.0005	0.0009	<0.0004	<0.0004
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.312	0.309	0.259	0.254	0.272	0.273
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	0.0005	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0024	0.0025	0.0013	0.0013	0.0016	0.0014
Vanadium (V)	mg L^{-1}	0.1	0.0002	<0.0002	<0.0002	0.0003	0.0003	0.0003	0.0003
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.005	0.005	<0.004	0.004	0.012	0.007

Appendix Table 3.5 (continued) 2007 Water Quality Analyses – M2 Canal MID sampling site

Parameter	Units	Irrigation Guideline^5	D.L.^{7}	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	—	0.025	0.1053	0.1379	0.0835	0.0943	0.0484	0.0637
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	0.0237	0.0229*	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.0318	0.0465	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	–	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

* Detected with good peak values and minimal background noise but below stated quantifiable limit.

Appendix Table 3.6. 2007 Water Quality Analyses – M2 Canal END sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.05	0.1	0.06	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.5	0.5	0.4	0.5	0.4	0.5
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	31	29	34	36	32	34
Magnesium (Mg)	mg L^{-1}	---	0.1	20	19	19	19	19	18
Sodium (Na)	mg L^{-1}	---	1	24	25	27	27	28	27
Potassium (K)	mg L^{-1}	---	0.1	3	3	4	4	4	4
Chloride (Cl)	mg L^{-1}	100-700[6]	1	8	8	9	10	11	10
Sulfate (SO_4)	mg L^{-1}	---	4	67	68	72	73	72	71
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	127	116	133	138	131	136
Bicarbonate (HCO_3)	mg L^{-1}	---	5	155	142	102	168	159	165
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	30	<5	<5	<5
pH	pH	---	0.1	8.4	8.2	8.7	8.2	8.3	8.3
Electrical Conductivity	uS cm^{-1}	---	10	410	400	400	420	420	420
Temperature (at sampling)	^{0}C	---	0.1	15.6	13.3	28.3	27.1	18.4	16.4
Turbidity Rating (1-5)[1]	---	---	---	1	---	1	---	1	---
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	229	222	245	252	245	246
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	160	151	163	168	158	159
SAR[4]	---	---	---	0.8	0.9	0.9	0.9	1.0	0.9
Bacteria									
Total Coliforms	MPN/100mL	1000	3	83	57	6	5	39	14
Fecal Coliforms	MPN/100mL	100	3	36	16	62	O.G.[8]	146	86

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

[8] Overgrowth of non coliform colonies present – no data presented

Appendix Table 3.6 (continued) 2007 Water Quality Analyses – M2 Canal END sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.03	0.03	0.03	0.04	<0.02	0.04
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0009	0.0007	0.0007	0.002	0.0009	0.0009
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0015	0.0014	0.0012	0.0011	0.001	0.001
Barium (Ba)	mg L^{-1}	---	0.0002	0.0528	0.0513	0.0669	0.0714	0.0702	0.0755
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.03	0.03	0.03	0.03	0.03	0.02
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	0.0003	0.0005	0.0005	<0.0002	0.0004
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	0.0014	0.0009	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	0.003	<0.001	0.002	<0.001	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	0.037	0.017	0.028	0.031	0.016	0.023
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	0.0001	0.0001	0.0002	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.013	0.013	<0.0002	0.014	0.013	0.013
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.043	0.013	0.01	0.006	0.013	0.005
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0011	0.0014	0.0014	0.0015	0.0014	0.0014
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0016	0.0021	0.0085	0.0022	0.0017	0.0021
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	<0.0004	0.0004	0.0006	0.0005	<0.0004	<0.0004
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.255	0.242	0.253	0.264	0.247	0.269
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0013	0.0013	0.0013	0.0013	0.0012	0.0014
Vanadium (V)	mg L^{-1}	0.1	0.0002	<0.0002	0.0003	0.0004	0.0004	<0.0002	0.0003
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	0.006	<0.004	<0.004	<0.004	0.005

Appendix Table 3.6 (continued) 2007 Water Quality Analyses – M2 Canal END sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	—	0.025	0.7898	13.4638	0.1259	0.1530	0.0570	0.0764
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	0.0301	0.0245	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.0509	0.0465	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	–	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 3.7. 2007 Water Quality Analyses – 1C Drain ditch sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.07	<0.05	0.07	<0.05	0.07
Nitrate-N (NO_3-N)	mg L^{-1}	—	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	—	0.2	1.3	1.4	0.6	0.7	0.6	0.8
Total P	mg L^{-1}	—	0.2	0.3	0.2	<0.2	<0.2	0.2	0.3
Orthophosphate (PO_4-P)	mg L^{-1}	—	0.02	0.15	0.12	0.08	0.07	0.02	0.03
Calcium (Ca)	mg L^{-1}	—	1	57	53	37	38	37	37
Magnesium (Mg)	mg L^{-1}	—	0.1	34	35	22	23	20	21
Sodium (Na)	mg L^{-1}	—	1	172	44	29	31	28	29
Potassium (K)	mg L^{-1}	—	0.1	13	14	4	5	5	5
Chloride (Cl)	mg L^{-1}	100-700[6]	1	14	13	9	9	11	10
Sulfate (SO_4)	mg L^{-1}	---	4	172	170	80	92	75	78
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	—	5	189	179	149	147	150	147
Bicarbonate (HCO_3)	mg L^{-1}	—	5	230	219	117	180	183	179
Hydroxide (OH)	mg L^{-1}	—	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	—	5	<5	<5	32	<5	<5	<5
pH	pH	---	0.1	8.2	8.4	8.6	8.3	8.3	8.2
Electrical Conductivity	uS cm^{-1}	---	10	720	710	440	480	460	460
Temperature (at sampling)	^{0}C	---	0.1	16.8	13.7	29	26.6	19.1	16.7
Turbidity Rating (1-5)[1]	—	---	---	1	—	1	—	1	---
Total Suspended Solids	mg L^{-1}	--	10	<10	10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	—	453	436	270	286	266	169
Hardness (as $CaCO_3$)[3]	mg L^{-1}	—	—	282	276	183	190	175	179
SAR[4]	---	—	—	4.4	1.1	0.9	1.0	0.9	0.9
Bacteria									
Total Coliforms	MPN/100mL	1000	3	13	6	9	<1	7	7
Fecal Coliforms	MPN/100mL	100	3	7	3	22	17	49	32

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 3.7 (continued) 2007 Water Quality Analyses – 1C Drain ditch sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	$mg\ L^{-1}$	5.0	0.02	0.08	0.13	0.07	0.07	0.14	0.16
Antimony (Sb)	$mg\ L^{-1}$	---	0.0004	0.0008	0.0006	0.0009	0.001	0.0013	0.001
Arsenic (As)	$mg\ L^{-1}$	0.1	0.0004	0.0031	0.0029	0.0024	0.002	0.0013	0.0013
Barium (Ba)	$mg\ L^{-1}$	---	0.0002	0.0699	0.0664	0.0578	0.0543	0.0801	0.0834
Beryllium (Be)	$mg\ L^{-1}$	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	$mg\ L^{-1}$	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	$mg\ L^{-1}$	0.5-6.0[6]	0.02	0.04	0.04	0.03	0.03	0.02	0.02
Cadmium (Cd)	$mg\ L^{-1}$	0.005	0.0002	<0.0002	0.0005	<0.0002	0.0004	<0.0002	<0.0002
Chromium (Cr)	$mg\ L^{-1}$	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	0.0012	<0.0008	<0.0008
Cobalt (Co)	$mg\ L^{-1}$	0.05	0.0002	0.0004	0.0004	<0.0002	<0.0002	0.0002	0.0002
Copper (Cu)	$mg\ L^{-1}$	0.2-1.0[6]	0.001	0.002	0.004	<0.001	0.001	<0.001	0.001
Iron (Fe)	$mg\ L^{-1}$	5.0	0.005	0.258	0.262	0.087	0.084	0.171	0.185
Lead (Pb)	$mg\ L^{-1}$	0.2	0.0001	0.0001	0.0004	<0.0001	0.0001	0.0002	0.0002
Lithium (Li)	$mg\ L^{-1}$	2.5	0.006	0.049	0.051	0.014	0.017	0.015	0.016
Manganese (Mn)	$mg\ L^{-1}$	0.2	0.001	0.049	0.042	0.029	0.011	0.02	0.028
Mercury (Hg)	$mg\ L^{-1}$	---	0.00010	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002
Molybdenum (Mo)	$mg\ L^{-1}$	0.01-0.05	0.0001	0.001	0.001	0.0011	0.0013	0.0014	0.0014
Nickel (Ni)	$mg\ L^{-1}$	0.2	0.0002	0.0001	0.003	0.0021	0.0021	0.0019	0.0021
Selenium (Se)	$mg\ L^{-1}$	0.02-0.05	0.0004	0.0006	0.0007	0.0006	<0.0004	<0.0004	<0.0004
Sliver (Ag)	$mg\ L^{-1}$	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	$mg\ L^{-1}$	---	0.0002	0.338	0.33	0.267	0.261	0.27	0.281
Tellurium (Te)	$mg\ L^{-1}$	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	$mg\ L^{-1}$	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	$mg\ L^{-1}$	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	$mg\ L^{-1}$	---	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.008
Uranium (U)	$mg\ L^{-1}$	0.01	0.0001	0.0015	0.0022	0.0009	0.0012	0.0015	0.0014
Vanadium (V)	$mg\ L^{-1}$	0.1	0.0002	0.0008	0.001	0.0009	0.0009	0.0007	0.0007
Zinc (Zn)	$mg\ L^{-1}$	1.0-5.0	0.004	0.005	0.009	0.005	0.005	0.007	0.009

Appendix Table 3.7 (continued) 2007 Water Quality Analyses – 1C Drain ditch sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 26		July 17		August 14	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	—	0.025	1.5217	0.3252	0.1320	0.2939	0.0674	0.0794
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	0.0136*	0.0246	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	0.0499	0.0744	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.1037	0.1260	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	–	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

* Detected with good peak values and minimal background noise but below stated quantifiable limit.

Appendix Table 3.8. 2007 Water Quality Analyses – Moon Lake Irrigation District INLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	$mg\ L^{-1}$	—	0.05	<0.05	0.07	0.09
Nitrate-N (NO_3-N)	$mg\ L^{-1}$	—	0.5	<0.1	<0.1	<0.1
Nitrite-N (NO_2-N)	$mg\ L^{-1}$	—	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	$mg\ L^{-1}$	—	0.2	1.3	1.3	1.0
Total P	$mg\ L^{-1}$	—	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	$mg\ L^{-1}$	—	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	$mg\ L^{-1}$	—	1	51	46	38
Magnesium (Mg)	$mg\ L^{-1}$	—	0.1	41	50	43
Sodium (Na)	$mg\ L^{-1}$	—	1	83	102	84
Potassium (K)	$mg\ L^{-1}$	—	0.1	18	20	16
Chloride (Cl)	$mg\ L^{-1}$	100-700[6]	1	66	82	64
Sulfate (SO_4)	$mg\ L^{-1}$	—	4	202	255	210
Alkalinity, Total (as $CaCO_3$)	$mg\ L^{-1}$	—	5	168	163	146
Bicarbonate (HCO_3)	$mg\ L^{-1}$	—	5	205	141	122
Hydroxide (OH)	$mg\ L^{-1}$	—	5	<5	<5	<5
Carbonate (CO_3)	$mg\ L^{-1}$	—	5	<5	29	28
pH	pH	—	0.1	8.2	8.6	8.7
Electrical Conductivity	$uS\ cm^{-1}$	—	10	870	980	840
Temperature (at sampling)	^0C	—	0.1	20.0	25.5	21.0
Turbidity Rating (1-5)[1]	—	—	—	3	1	1
Total Suspended Solids	$mg\ L^{-1}$	–	10	<10	10	<10
TDS (calculated)[2]	$mg\ L^{-1}$	500-3500[6]	—	562	653	543
Hardness (as $CaCO_3$)[3]	$mg\ L^{-1}$	—	—	296	321	272
SAR[4]	—	—	—	2.1	2.5	2.2
Bacteria						
Total Coliforms	MPN/100mL	1000	3	10	16	3
Fecal Coliforms	MPN/100mL	100	3	1	4	O.G.[8]

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca ($mg\ L^{-1}$)*2.5 + Mg ($mg\ L^{-1}$)*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

[8] Overgrowth of non coliform colonies present – no data presented

Appendix Table 3.8 (continued). 2007 Water Quality Analyses – Moon Lake Irrigation District INLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.07	0.05	0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0008	0.0008	0.0007
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0018	0.0027	0.002
Barium (Ba)	mg L^{-1}	---	0.0002	0.116	0.107	0.0863
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.07	0.09	0.07
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	0.0041	<0.005
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0003	0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	<0.001	<0.001	<0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.102	0.051	0.03
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0001	0.0001	0.0002
Lithium (Li)	mg L^{-1}	2.5	0.006	0.063	0.074	0.061
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.069	0.064	0.036
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.0002	<0.0002	<0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0008	0.0006	0.0007
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.002	0.0019	0.0015
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0008	0.0004	0.0006
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.411	0.45	0.366
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	0.006	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0009	0.001	0.0009
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0004	0.0015	<0.001
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.005	<0.004	0.005

Appendix Table 3.8 (continued). 2007 Water Quality Analyses – Moon Lake Irrigation District INLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.1725	0.1604	0.0796
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	0.0126*	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	0.0441	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.0920	0.0976	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 3.9. 2007 Water Quality Analyses – Moon Lake Irrigation District OUTLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.19	0.07
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.1	<0.1	<0.1
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.9	0.8	0.6
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	0.6
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	0.04	<0.02
Calcium (Ca)	mg L^{-1}	---	1	26	27	26
Magnesium (Mg)	mg L^{-1}	---	0.1	27	34	23
Sodium (Na)	mg L^{-1}	---	1	50	68	25
Potassium (K)	mg L^{-1}	---	0.1	9	12	5
Chloride (Cl)	mg L^{-1}	100-700[6]	1	32	47	16
Sulfate (SO_4)	mg L^{-1}	---	4	116	151	92
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	117	137	116
Bicarbonate (HCO_3)	mg L^{-1}	---	5	142	167	142
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5
pH	pH	---	0.1	8.0	7.6	7.6
Electrical Conductivity	uS cm^{-1}	---	10	550	690	460
Temperature (at sampling)	^0C	---	0.1	19.0	23.5	19.0
Turbidity Rating (1-5)[1]	---	---	---	1	1	1
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	330	421	257
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	176	207	160
SAR[4]	---	---	---	1.6	2.0	0.9
Bacteria						
Total Coliforms	MPN/100mL	1000	3	14	10	3
Fecal Coliforms	MPN/100mL	100	3	3	4	21

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 3.9 (continued). 2007 Water Quality Analyses – Moon Lake Irrigation District OUTLET sampling site

Parameter	**Units**	**Irrigation Guideline**[5]	**D.L.**[7]	**June 27**	**July 17**	**August 14**
				Grab Sample	**Grab Sample**	**Grab Sample**
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.07	<0.02	0.05
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0006	0.0006	<0.0004
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0013	0.0017	0.0009
Barium (Ba)	mg L^{-1}	---	0.0002	0.0607	0.0841	0.0743
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.04	0.05	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	0.0026	<0.005
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	<0.001	<0.001	<0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.128	0.07	0.101
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.035	0.043	0.02
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.038	0.047	0.025
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.0002	<0.0002	<0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0006	0.0003	0.0008
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0014	0.0013	0.0011
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0006	0.0004	<0.0004
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.25	0.283	0.239
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0003	0.0002	0.0003
Vanadium (V)	mg L^{-1}	0.1	0.0002	<0.0002	0.0007	<0.001
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.005	<0.004	<0.004

Appendix Table 3.9 (continued). 2007 Water Quality Analyses – Moon Lake Irrigation District OUTLET sampling site

Parameter	**Units**	**Irrigation Guideline^{5}**	**D.L.^{7}**	**June 27**	**July 17**	**August 14**
				Grab Sample	**Grab Sample**	**Grab Sample**
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.3272	0.4342	<0.025
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	0.0327	0.0634	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	0.0352	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.0657	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 3.10. 2007 Water Quality Analyses – Brightwater Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	1.36	0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.1	<0.1	<0.1
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.9	5.1	1.8
Total P	mg L^{-1}	---	0.2	<0.2	0.4	0.3
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	0.03	0.04	0.13
Calcium (Ca)	mg L^{-1}	---	1	37	31	31
Magnesium (Mg)	mg L^{-1}	---	0.1	21	21	21
Sodium (Na)	mg L^{-1}	---	1	33	34	32
Potassium (K)	mg L^{-1}	---	0.1	10	10	7
Chloride (Cl)	mg L^{-1}	100-700[6]	1	7	9	9
Sulfate (SO_4)	mg L^{-1}	---	4	115	109	87
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	125	127	131
Bicarbonate (HCO_3)	mg L^{-1}	---	5	153	154	107
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	26
pH	pH	---	0.1	8.6	8.4	8.7
Electrical Conductivity	uS cm^{-1}	---	10	440	450	440
Temperature (at sampling)	^{0}C	---	0.1	16.0	26.5	17.0
Turbidity Rating (1-5)[1]	---	---	---	3	3	3
Total Suspended Solids	mg L^{-1}	--	10	<10	30	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	298	290	266
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	179	164	164
SAR[4]	---	---	---	1.1	1.2	1.1
Bacteria						
Total Coliforms	MPN/100mL	1000	3	2	O.G.[8]	36
Fecal Coliforms	MPN/100mL	100	3	<1	O.G.	O.G.

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(Total\ Alkalinity*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = $Na^+ (meq\ L^{-1})/[[Ca^{++} (meq\ L^{-1}) + Mg^{++} (meq\ L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

[8] Overgrowth of non coliform colonies present – no data presented

Appendix Table 3.10 (continued). 2007 Water Quality Analyses – Brightwater Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.13	0.05	0.48
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0007	0.0005	0.0005
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0026	0.004	0.0056
Barium (Ba)	mg L^{-1}	—	0.0002	0.0545	0.0516	0.0571
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.06	0.05	0.04
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	0.0013	<0.005
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0005	0.0005	0.0005
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.002	0.001	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	0.184	0.085	0.464
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0002	<0.0001	0.0003
Lithium (Li)	mg L^{-1}	2.5	0.006	0.032	0.024	0.024
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.063	0.282	0.047
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.002	<0.0002	<0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0015	0.0017	0.0013
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.003	0.0028	0.0026
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0007	0.0008	<0.0004
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.208	0.204	0.228
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	<0.005	<0.005	0.012
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0009	0.001	0.0011
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0006	0.0009	0.0026
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.016	<0.004	0.01

Appendix Table 3.10 (continued). 2007 Water Quality Analyses – Brightwater Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	—	0.025	0.0235	0.1911	0.1157
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	0.0289	<0.025	<0.025
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.0300	<0.025	<0.025
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025

Appendix Table 3.11. 2007 Water Quality Analyses – Blackstrap Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.06	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.1	<0.1	>0.1
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.7	0.8	0.6
Total P	mg L^{-1}	---	0.2	<0.2	0.8	0.3
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	57	53	56
Magnesium (Mg)	mg L^{-1}	---	0.1	43	44	44
Sodium (Na)	mg L^{-1}	---	1	68	71	70
Potassium (K)	mg L^{-1}	---	0.1	8	9	9
Chloride (Cl)	mg L^{-1}	100-700[6]	1	18	18	18
Sulfate (SO_4)	mg L^{-1}	---	4	244	251	252
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	173	171	178
Bicarbonate (HCO_3)	mg L^{-1}	---	5	211	152	217
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	28	<5
pH	pH	---	0.1	8.4	8.5	8.3
Electrical Conductivity	uS cm^{-1}	---	10	770	790	820
Temperature (at sampling)	^0C	---	0.1	16.0	25.5	19.0
Turbidity Rating (1-5)[1]	---	---	---	1	1	1
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	542	549	556
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	319	314	321
SAR[4]	---	---	---	1.6	1.7	1.7
Bacteria						
Total Coliforms	MPN/100mL	1000	3	4	O.G.[8]	1
Fecal Coliforms	MPN/100mL	100	3	1	94	63

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = $Ca\ (mg\ L^{-1})*2.5 + Mg\ (mg\ L^{-1})*4.12$

[4] Sodium Adsorption Ratio = $Na^+\ (meq\ L^{-1})/[[Ca^{++}\ (meq\ L^{-1}) + Mg^{++}\ (meq\ L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

[8] Overgrowth of non coliform colonies present – no data presented

Appendix Table 3.11 (continued). 2007 Water Quality Analyses – Blackstrap Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.11	0.07	0.04
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0007	0.0006	0.0006
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0018	0.0023	0.0028
Barium (Ba)	mg L^{-1}	—	0.0002	0.111	0.0966	0.0946
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.09	0.10	0.10
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	0.0014	<0.005
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	0.001	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.097	0.070	0.030
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.053	0.047	0.054
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.012	0.025	0.011
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.0002	<0.0002	<0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0029	0.0029	0.0028
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0027	0.0024	0.0023
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0009	0.0007	0.0007
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.408	0.391	0.417
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0018	0.0019	0.0017
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0012	0.0016	<0.001
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.006	<0.004	<0.004

Appendix Table 3.11 (continued). 2007 Water Quality Analyses – Blackstrap Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	—	0.025	0.0422	0.0503	0.0420
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	0.0237	<0.025
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025

Appendix Table 3.12. 2007 Water Quality Analyses – Bradwell Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	—	0.05	<0.05	<0.05	0.06
Nitrate-N (NO_3-N)	mg L^{-1}	—	0.5	<0.1	<0.1	<0.1
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	1.1	1.3	5.9
Total P	mg L^{-1}	—	0.2	<0.2	<0.2	0.4
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	0.04
Calcium (Ca)	mg L^{-1}	—	1	54	42	37
Magnesium (Mg)	mg L^{-1}	---	0.1	43	43	44
Sodium (Na)	mg L^{-1}	—	1	60	63	67
Potassium (K)	mg L^{-1}	---	0.1	11	11	11
Chloride (Cl)	mg L^{-1}	100-700[6]	1	16	17	20
Sulfate (SO_4)	mg L^{-1}	---	4	211	210	219
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	186	172	163
Bicarbonate (HCO_3)	mg L^{-1}	—	5	180	126	48
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	—	5	23	41	74
pH	pH	—	0.1	8.7	8.8	9.1
Electrical Conductivity	uS cm^{-1}	—	10	730	710	730
Temperature (at sampling)	^{0}C	—	0.1	19.0	25.5	18.0
Turbidity Rating (1-5)[1]	---	---	---	4	2	4
Total Suspended Solids	mg L^{-1}	–	10	<10	20	50
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	507	489	496
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	—	312	282	274
SAR[4]	---	---	---	1.5	1.6	1.8
Bacteria						
Total Coliforms	MPN/100mL	1000	3	2	1	26
Fecal Coliforms	MPN/100mL	100	3	2	<1	O.G.[8]

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^{+} (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

[8] Overgrowth of non coliform colonies present – no data presented

Appendix Table 3.12 (continued). 2007 Water Quality Analyses – Bradwell Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.07	0.04	0.08
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0006	0.0011	0.0006
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0022	0.0037	0.0044
Barium (Ba)	mg L^{-1}	---	0.0002	0.0917	0.0845	0.0758
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.01	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.10	0.10	0.10
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	0.0011	<0.005
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0002	0.0003	0.0003
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	<0.001	<0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.097	0.09	0.089
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.055	0.051	0.056
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.081	0.128	0.087
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.0002	<0.0002	<0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0021	0.0021	0.0021
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0023	0.0019	0.0019
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0011	0.0006	0.0005
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.438	0.438	0.393
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0016	0.0019	0.0018
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.001	0.0016	0.0023
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.005	<0.004	0.005

Appendix Table 3.12 (continued). 2007 Water Quality Analyses – Bradwell Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.0511	0.0345	0.0389
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	0.0247	<0.025	0.0268
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.0389	0.0488	0.0366
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 3.13. 2007 Water Quality Analyses – Lumsden-1 sampling site (upstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	0.26	<0.1	<0.1
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	1.0	0.7	0.8
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	0.03	<0.02
Calcium (Ca)	mg L^{-1}	---	1	40	38	36
Magnesium (Mg)	mg L^{-1}	---	0.1	23	22	21
Sodium (Na)	mg L^{-1}	---	1	52	50	52
Potassium (K)	mg L^{-1}	---	0.1	7	8	7
Chloride (Cl)	mg L^{-1}	100-700[6]	1	18	17	18
Sulfate (SO_4)	mg L^{-1}	---	4	118	112	117
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	152	154	141
Bicarbonate (HCO_3)	mg L^{-1}	---	5	185	188	172
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5
pH	pH	---	0.1	8.3	8.3	8.6
Electrical Conductivity	uS cm^{-1}	---	10	510	520	550
Temperature (at sampling)	^{0}C	---	0.1	19.0	25.0	---
Turbidity Rating (1-5)[1]	---	---	---	3	3	4
Total Suspended Solids	mg L^{-1}	--	10	60	80	70
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	350	339	336
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	195	185	176
SAR[4]	---	---	---	1.6	1.6	1.7
Bacteria						
Total Coliforms	MPN/100mL	1000	3	O.G.[8]	O.G.	37
Fecal Coliforms	MPN/100mL	100	3	40	32	O.G.

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = $Ca\ (mg\ L^{-1})*2.5 + Mg\ (mg\ L^{-1})*4.12$

[4] Sodium Adsorption Ratio = $Na^+\ (meq\ L^{-1})/[[Ca^{++}\ (meq\ L^{-1}) + Mg^{++}\ (meq\ L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

[8] Overgrowth of non coliform colonies present – no data presented

Appendix Table 3.13 (continued). 2007 Water Quality Analyses – Lumsden-1 sampling site (upstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	2.28	4.07	2.2
Antimony (Sb)	mg L^{-1}	—	0.0004	0.001	0.0008	0.0007
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0044	0.0053	0.0051
Barium (Ba)	mg L^{-1}	—	0.0002	0.0774	0.101	0.0874
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.16	0.09	0.08
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0032	0.0063	0.0039
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0014	0.0011	0.0008
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.004	0.004	0.003
Iron (Fe)	mg L^{-1}	5.0	0.005	2.66	2.98	1.83
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0013	0.0018	0.0011
Lithium (Li)	mg L^{-1}	2.5	0.006	0.05	0.028	0.031
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.17	0.157	0.144
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.0002	<0.0002	<0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0191	0.0021	0.0022
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0105	0.005	0.0038
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0022	0.0009	<0.0004
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.345	0.263	0.262
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	0.053	0.112	0.061
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0017	0.0016	0.0014
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0394	0.0129	0.0077
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.011	0.011	0.008

Appendix Table 3.13 (continued). 2007 Water Quality Analyses – Lumsden-1 sampling site (upstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.2117	0.1521	0.0959
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	0.0340	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.0307	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 3.14. 2007 Water Quality Analyses – Lumsden-2 sampling site (downstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	0.17	<0.05	0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	4.4	1.6	2.0
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	0.37	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	1.7	1.6	1.2
Total P	mg L^{-1}	---	0.2	0.3	0.3	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	0.12	0.07	0.1
Calcium (Ca)	mg L^{-1}	---	1	61	55	43
Magnesium (Mg)	mg L^{-1}	---	0.1	31	29	24
Sodium (Na)	mg L^{-1}	---	1	106	84	66
Potassium (K)	mg L^{-1}	---	0.1	10	10	9
Chloride (Cl)	mg L^{-1}	100-700[6]	1	77	55	38
Sulfate (SO_4)	mg L^{-1}	---	4	211	177	145
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	154	170	137
Bicarbonate (HCO_3)	mg L^{-1}	---	5	188	207	167
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5
pH	pH	---	0.1	8.1	8.1	8.3
Electrical Conductivity	uS cm^{-1}	---	10	870	790	660
Temperature (at sampling)	^{0}C	---	0.1	16.0	27.0	---
Turbidity Rating (1-5)[1]	---	---	---	3	4	4
Total Suspended Solids	mg L^{-1}	--	10	70	120	100
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	610	519	416
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	280	257	206
SAR[4]	---	---	---	2.7	2.3	2.0
Bacteria						
Total Coliforms	MPN/100mL	1000	3	O.G.[8]	O.G.	84
Fecal Coliforms	MPN/100mL	100	3	47	29	O.G.

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

[8] Overgrowth of non coliform colonies present – no data presented

Appendix Table 3.14 (continued). 2007 Water Quality Analyses – Lumsden-2 sampling site (downstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	2.28	6.1	4.11
Antimony (Sb)	mg L^{-1}	—	0.0004	0.001	0.0009	0.0008
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0044	0.0058	0.0055
Barium (Ba)	mg L^{-1}	---	0.0002	0.0774	0.113	0.0971
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.16	0.14	0.12
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0032	0.0098	0.0061
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0014	0.0019	0.0016
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.004	0.005	0.004
Iron (Fe)	mg L^{-1}	5.0	0.005	2.66	4.28	3.49
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0013	0.0025	0.0019
Lithium (Li)	mg L^{-1}	2.5	0.006	0.05	0.041	0.038
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.17	0.216	0.181
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.0002	<0.0002	<0.0002
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0191	0.0093	0.005
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0105	0.0098	0.0064
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0022	0.0016	0.0009
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.345	0.33	0.28
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	0.053	0.184	0.124
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0017	0.0022	0.0015
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0394	0.0366	0.0236
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.011	0.016	0.016

Appendix Table 3.14 (continued). 2007 Water Quality Analyses – Lumsden-2 sampling site (downstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 27	July 17	August 14
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.2772	0.1731	0.1536
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	0.0874	0.0694	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	0.0685	0.0337	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.0638	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	0.1295	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix 4

2008 Water Quality Data

Appendix Table 4.1. 2008 Water Quality Analyses – Riverhurst Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	—	0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	—	0.5	<0.5	<0.5	0.53
Nitrite-N (NO_2-N)	mg L^{-1}	—	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	—	0.2	0.3	0.4	0.3
Total P	mg L^{-1}	—	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	—	0.02	<0.02	0.06	<0.02
Calcium (Ca)	mg L^{-1}	—	1	39	42	47
Magnesium (Mg)	mg L^{-1}	—	0.1	14.4	15.3	16.8
Sodium (Na)	mg L^{-1}	—	1	17	20	21
Potassium (K)	mg L^{-1}	—	0.1	2.2	2.3	2.4
Chloride (Cl)	mg L^{-1}	100-700[6]	1	6	7	7
Sulfate (SO_4)	mg L^{-1}	—	4	48	59	63
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	—	5	137	145	147
Bicarbonate (HCO_3)	mg L^{-1}	—	5	168	177	179
Hydroxide (OH)	mg L^{-1}	—	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	—	5	<5	<5	<5
pH	pH	—	0.1	8.4	8.6	8.6
Electrical Conductivity	uS cm^{-1}	—	10	380	410	410
Temperature (at sampling)	^0C	—	0.1	18.0	20.0	20.0
Turbidity Rating (1-5)[1]	—	—	—	2	3	1-2
Total Suspended Solids	mg L^{-1}	–	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	—	209	233	248
Hardness (as $CaCO_3$) [3]	mg L^{-1}	—	—	157	168	187
SAR[4]	—	—	—	0.6	0.7	0.7
Bacteria						
Total Coliforms	MPN/100mL	1000	3	15	430	93
Fecal Coliforms	MPN/100mL	100	3	15	**230**	<3

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(Total\ Alkalinity*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.1 (continued). 2008 Water Quality Analyses – Riverhurst Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.28	0.20	0.04
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0010	0.0009	0.0009
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0008	0.0006	0.0008
Barium (Ba)	mg L^{-1}	---	0.0002	0.0931	0.0715	0.0798
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.02	<0.02	0.02
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0017	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.003	0.005	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	0.372	0.255	0.048
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0003	0.0004	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.008	0.007	0.007
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.009	0.007	0.002
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0014	0.0012	0.0014
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0032	0.0025	0.0025
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0013	0.0008	0.0007
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.247	0.223	0.260
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	<0.005	0.006	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0012	0.0011	0.0012
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0014	0.0009	0.0008
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	0.007	<0.004

Appendix Table 4.1 (continued). 2008 Water Quality Analyses – Riverhurst Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.044	0.056	0.044
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 4.2. 2008 Water Quality Analyses – Luck Lake Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	—	0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	—	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	—	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	—	0.2	0.3	0.3	0.3
Total P	mg L^{-1}	—	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	—	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	—	1	44	42	46
Magnesium (Mg)	mg L^{-1}	—	0.1	17.0	15.5	16.5
Sodium (Na)	mg L^{-1}	—	1	24	20	21
Potassium (K)	mg L^{-1}	—	0.1	2.6	2.3	2.5
Chloride (Cl)	mg L^{-1}	100-700[6]	1	9	7	7
Sulfate (SO_4)	mg L^{-1}	—	4	65	58	64
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	—	5	156	146	147
Bicarbonate (HCO_3)	mg L^{-1}	—	5	190	178	180
Hydroxide (OH)	mg L^{-1}	—	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	—	5	<5	<5	<5
pH	pH	—	0.1	8.4	8.5	8.5
Electrical Conductivity	uS cm^{-1}	—	10	460	410	410
Temperature (at sampling)	^{0}C	—	0.1	18.0	19.0	19.0
Turbidity Rating (1-5)[1]	—	—	—	1-2	2-3	1-2
Total Suspended Solids	mg L^{-1}	–	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	—	255	232	245
Hardness (as $CaCO_3$)[3]	mg L^{-1}	—	—	180	169	183
SAR[4]	—	—	—	0.8	0.7	0.7
Bacteria						
Total Coliforms	MPN/100mL	1000	3	150	380	9
Fecal Coliforms	MPN/100mL	100	3	14	21	<3

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.2 (continued). 2008 Water Quality Analyses – Luck Lake Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.08	0.05	0.03
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0019	0.0011	0.0009
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0008	0.0006	0.0008
Barium (Ba)	mg L^{-1}	---	0.0002	0.0911	0.0843	0.0811
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.02	0.02	0.02
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.002	0.003	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	0.100	0.044	0.044
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0001	0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.010	0.007	0.007
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.004	0.002	0.002
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0014	0.0014
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0030	0.0021	0.0026
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0014	0.0006	0.0006
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.278	0.255	0.260
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0014	0.0012	0.0012
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0008	0.0006	0.0007
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	<0.004	<0.004

Appendix Table 4.2 (continued). 2008 Water Quality Analyses – Luck Lake Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.038	0.053	0.058
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 4.3. 2008 Water Quality Analyses – M1 Main Canal sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.3	0.4	0.3	0.3	0.3	0.4
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	45	46	45	45	42	45
Magnesium (Mg)	mg L^{-1}	---	0.1	17.6	17.9	17.4	17.9	15.8	16.8
Sodium (Na)	mg L^{-1}	---	1	24	25	24	25	21	22
Potassium (K)	mg L^{-1}	---	0.1	3.0	3.1	2.9	3.0	2.6	2.7
Chloride (Cl)	mg L^{-1}	100-700[6]	1	9	9	9	9	8	8
Sulfate (SO_4)		---	4	65	67	65	68	62	66
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	167	165	161	159	152	153
Bicarbonate (HCO_3)	mg L^{-1}	---	5	203	201	220	194	185	187
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
pH	pH	---	0.1	8.3	8.3	8.7	8.6	8.5	8.5
Electrical Conductivity	uS cm^{-1}	---	10	470	470	460	460	440	440
Temperature (at sampling)	^{0}C	---	0.1	17.2	19.2	18.4	20.3	21.2	20.2
Turbidity Rating (1-5)[1]	---	---	---	3	-	2	-	1	-
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	264	267	260	263	243	252
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	185	189	184	186	170	182
SAR[4]	---	---	---	0.8	0.8	0.8	0.8	0.7	0.7
Bacteria									
Total Coliforms	MPN/100mL	1000	3	23	<3	93	23	15	<3
Fecal Coliforms	MPN/100mL	100	3	23	<3	7	<3	<3	<3

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.3 (continued) 2008 Water Quality Analyses – M1 Main Canal sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.11	0.04	0.05	0.04	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0014	0.0016	0.0007	0.0010	0.0009	0.0008
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0011	0.0011	0.0010	0.0010	0.0009	0.0008
Barium (Ba)	mg L^{-1}	---	0.0002	0.0866	0.0859	0.0861	0.0864	0.0831	0.0848
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.03	0.03	0.03	0.02	0.02	0.02
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.002	0.002	0.002	0.002	0.002	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	0.151	0.041	0.052	0.038	0.021	0.022
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.012	0.011	0.008	0.010	0.009	0.008
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.007	0.004	0.005	0.004	0.003	0.003
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0016	0.0016	0.0016	0.0015	0.0016
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0028	0.0029	0.0025	0.0024	0.0021	0.0022
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0005	<0.0004	0.0006	0.0007	<0.0004	0.0006
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.288	0.291	0.284	0.284	0.257	0.256
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	0.0017	0.0023	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0014	0.0014	0.0013	0.0013	0.0013	0.0014
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0007	0.0005	0.0004	0.0003	0.0004	0.0004
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	0.005	<0.004	<0.004	<0.004	<0.004

Appendix Table 4.3 (continued) 2008 Water Quality Analyses – M1 Main Canal sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	—	0.025	0.262	0.161	0.060	0.112	0.057	0.025
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	0.047	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	**0.028**	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	--	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 4.4. 2008 Water Quality Analyses – M2 Canal START sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.10	0.05	0.12	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.09
Total Kjeldahl N	mg L^{-1}	---	0.2	0.3	0.5	0.4	0.5	0.3	0.6
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	41	41	37	39	40	41
Magnesium (Mg)	mg L^{-1}	---	0.1	18.0	18.0	18.0	18.4	16.9	17.1
Sodium (Na)	mg L^{-1}	---	1	25	25	25	26	23	23
Potassium (K)	mg L^{-1}	---	0.1	3.1	3.1	2.9	3.1	2.9	2.8
Chloride (Cl)	mg L^{-1}	100-700[6]	1	9	9	9	10	8	8
Sulfate (SO_4)	mg L^{-1}	---	4	66	67	69	71	68	68
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	153	157	141	148	146	143
Bicarbonate (HCO_3)	mg L^{-1}	---	5	186	192	172	180	178	175
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
pH	pH	---	0.1	8.5	8.4	8.6	8.6	8.4	8.4
Electrical Conductivity	uS cm^{-1}	---	10	450	470	430	450	430	440
Temperature (at sampling)	^{0}C	---	0.1	19.1	20.1	20.3	20.6	20.5	21.4
Turbidity Rating (1-5)[1]	---	---	---	1	-	1	-	1	-
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	254	257	246	256	246	246
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	177	177	167	173	169	173
SAR[4]	---	---	---	0.8	0.8	0.8	0.9	0.8	0.8
Bacteria									
Total Coliforms	MPN/100mL	1000	3	<3	<3	4	430	4	4
Fecal Coliforms	MPN/100mL	100	3	<3	<3	<3	6	<3	<3

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = $Ca\ (mg\ L^{-1})*2.5 + Mg\ (mg\ L^{-1})*4.12$

[4] Sodium Adsorption Ratio = $Na^{+}\ (meq/L)/[[Ca^{++}\ (meq/L) + Mg^{++}\ (meq/L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.4 (continued) 2008 Water Quality Analyses – M2 Canal START sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	<0.02	0.03	<0.02	0.03	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0016	0.0014	0.0011	0.0011	0.0008	0.0009
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0011	0.0011	0.0011	0.0011	0.0010	0.0009
Barium (Ba)	mg L^{-1}	---	0.0002	0.0688	0.0835	0.0771	0.0820	0.0849	0.0843
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.03	0.03	0.02	0.03	0.02	0.02
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	0.001	0.001	0.002	0.001	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.023	0.041	0.022	0.027	0.019	0.011
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.012	0.013	0.010	0.012	0.009	0.009
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.020	0.021	0.013	0.007	0.009	0.003
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0017	0.0016	0.0017	0.0017	0.0017
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0024	0.0025	0.0020	0.0021	0.0021	0.0020
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	<0.0004	<0.0004	0.0007	0.0006	0.0006	0.0005
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.284	0.294	0.262	0.281	0.252	0.255
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	0.0018	0.0016	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0014	0.0014	0.0012	0.0014	0.0013	0.0014
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0004	0.0005	0.0004	0.0003	0.0005	0.0005
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004

Appendix Table 4.4 (continued) 2008 Water Quality Analyses – M2 Canal START sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	---	0.025	0.081	0.074	0.089	0.068	0.060	0.063
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	0.059	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	**0.026**	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	--	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 4.5. 2008 Water Quality Analyses – M2 Canal MID sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.11	<0.05	0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.4	0.6	0.4	0.5	0.3	0.4
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	42	41	37	37	40	41
Magnesium (Mg)	mg L^{-1}	---	0.1	18.6	19.9	18.9	19.3	17.4	17.6
Sodium (Na)	mg L^{-1}	---	1	25	26	26	26	24	24
Potassium (K)	mg L^{-1}	---	0.1	3.2	3.2	2.9	2.9	2.8	2.8
Chloride (Cl)	mg L^{-1}	100-700[6]	1	9	10	9	9	9	8
Sulfate (SO_4)	mg L^{-1}	---	4	69	76	73	78	71	72
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	157	154	142	144	142	141
Bicarbonate (HCO_3)	mg L^{-1}	---	5	191	188	173	176	173	172
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
pH	pH	---	0.1	8.3	8.3	8.5	8.5	8.4	8.4
Electrical Conductivity	uS cm^{-1}	---	10	470	480	440	450	430	430
Temperature (at sampling)	^{0}C	---	0.1	18.3	17.1	21.8	17.8	21.1	19.5
Turbidity Rating (1-5)[1]	---	---	---	1	-	1	-	1	-
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	261	269	252	259	249	250
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	181	184	170	172	172	175
SAR[4]	---	---	---	0.8	0.8	0.9	0.9	0.8	0.8
Bacteria									
Total Coliforms	MPN/100mL	1000	3	23	23	43	9	15	<3
Fecal Coliforms	MPN/100mL	100	3	9	23	7	<3	4	<3

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^{+} (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.5 (continued) 2008 Water Quality Analyses – M2 Canal MID sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0012	0.0014	0.0011	0.0006	0.0009	0.0009
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0010	0.0012	0.0012	0.0011	0.0010	0.0009
Barium (Ba)	mg L^{-1}	---	0.0002	0.0711	0.0738	0.0710	0.0720	0.0843	0.0814
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.03	0.03	0.02	0.03	0.02	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	0.002	0.001	0.001	0.001	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.026	0.023	0.014	0.011	0.014	0.009
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.013	0.015	0.012	0.013	0.010	0.009
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.014	0.013	0.018	0.009	0.006	0.003
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0016	0.0014	0.0015	0.0016	0.0016
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0023	0.0023	0.0019	0.0020	0.0021	0.0020
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	<0.0004	<0.0004	0.0006	0.0006	<0.0004	0.0006
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.292	0.298	0.260	0.276	0.251	0.254
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	0.0014	0.0016	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0015	0.0019	0.0014	0.0017	0.0014	0.0013
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0004	0.0004	0.0003	0.0003	0.0004	0.0004
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004

Appendix Table 4.5 (continued) 2008 Water Quality Analyses – M2 Canal MID sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	---	0.025	0.078	0.256	0.095	0.065	0.046	0.052
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	0.066	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.023*	**0.028**	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	–	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

[*] Detected with good peak values and minimal background noise but below stated quantifiable limit.

Appendix Table 4.6. 2008 Water Quality Analyses – M2 Canal END sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	0.05	-	<0.05	<0.05	<0.05	0.07
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.4	-	0.4	0.6	0.4	0.4
Total P	mg L^{-1}	---	0.2	<0.2	-	<0.2	0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	39	-	37	34	36	36
Magnesium (Mg)	mg L^{-1}	---	0.1	19.1	-	20.2	18.4	18.7	17.9
Sodium (Na)	mg L^{-1}	---	1	25	-	27	26	25	24
Potassium (K)	mg L^{-1}	---	0.1	3.2	-	2.8	3.0	2.9	2.8
Chloride (Cl)	mg L^{-1}	100-700[6]	1	10	-	10	9	9	9
Sulfate (SO_4)	mg L^{-1}	---	4	72	-	79	71	70	70
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	153	-	141	133	137	133
Bicarbonate (HCO_3)	mg L^{-1}	---	5	187	-	172	162	167	163
Hydroxide (OH)	mg L^{-1}	---	5	<5	-	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	-	<5	<5	<5	<5
pH	pH	---	0.1	8.4	-	8.8	8.5	8.4	8.4
Electrical Conductivity	uS cm^{-1}	---	10	460	-	450	430	420	420
Temperature (at sampling)	^{0}C	---	0.1	20.4	-	21.5	20.0	17.1	21.4
Turbidity Rating (1-5)[1]	---	---	---	1	-	1	-	1	-
Total Suspended Solids	mg L^{-1}	--	10	<10	-	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	260	-	261	241	244	240
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	176	-	176	161	167	164
SAR[4]	---	---	---	0.8	-	0.9	0.9	0.8	0.8
Bacteria									
Total Coliforms	MPN/100mL	1000	3	75	-	380	**1500**	930	23
Fecal Coliforms	MPN/100mL	100	3	38	-	**230**	15	23	4

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.6 (continued) 2008 Water Quality Analyses – M2 Canal END sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.02	-	<0.02	<0.02	0.05	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0014	-	0.0009	0.0010	0.0009	0.0008
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0012	-	0.0012	0.0011	0.0010	0.0011
Barium (Ba)	mg L^{-1}	---	0.0002	0.0742	-	0.0728	0.0659	0.0783	0.0756
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.03	-	0.03	0.02	0.03	0.02
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	-	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	-	<0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	-	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	-	0.001	0.001	0.001	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.056	-	0.019	0.025	0.080	0.011
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.014	-	0.013	0.011	0.009	0.009
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.014	-	0.008	0.007	0.014	0.003
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	-	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0015	-	0.0016	0.0014	0.0016	0.0016
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0023	-	0.0019	0.0020	0.0020	0.0017
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	<0.0004	-	0.0005	0.0005	0.0005	0.0005
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	-	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.296	-	0.281	0.243	0.265	0.246
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	-	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	0.0015	-	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0016	-	0.0018	0.0012	0.0013	0.0012
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0004	-	0.0004	0.0002	0.0002	0.0004
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.012	-	<0.004	<0.004	0.007	<0.004

Appendix Table 4.6 (continued) 2008 Water Quality Analyses – M2 Canal END sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	—	0.025	0.401	2.337	0.093	0.084	0.368	0.095
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	**0.030**	**0.032**	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	–	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 4.7. 2008 Water Quality Analyses – 1C Drain ditch sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.05	<0.05	0.05	<0.05	0.10
Nitrate-N (NO$_3$-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrite-N (NO$_2$-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.6	0.7	0.7	0.8	0.5	0.7
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO$_4$-P)	mg L^{-1}	---	0.02	0.02	0.03	0.03	0.03	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	26	33	25	30	30	29
Magnesium (Mg)	mg L^{-1}	---	0.1	25.0	28.2	23.2	22.6	20.4	20.4
Sodium (Na)	mg L^{-1}	---	1	30	32	29	28	27	27
Potassium (K)	mg L^{-1}	---	0.1	3.4	3.7	3.8	3.6	3.4	3.4
Chloride (Cl)	mg L^{-1}	100-700[6]	1	10	10	9	9	9	9
Sulfate (SO$_4$)	mg L^{-1}	---	4	90	104	89	85	81	79
Alkalinity, Total (as CaCO$_3$)	mg L^{-1}	---	5	128	143	124	135	122	121
Bicarbonate (HCO$_3$)	mg L^{-1}	---	5	85	175	54	165	115	147
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO$_3$)	mg L^{-1}	---	5	35	<5	48	<5	17	<5
pH	pH	---	0.1	9.3	8.5	9.5	8.8	9.0	8.5
Electrical Conductivity	uS cm^{-1}	---	10	450	530	430	450	400	420
Temperature (at sampling)	^{0}C	---	0.1	21.4	19.1	22.2	19.1	21.8	19.7
Turbidity Rating (1-5)[1]	---	---	---	1	-	1	-	1	-
Total Suspended Solids	mg L^{-1}	--	10	<10	10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	261	297	253	259	244	240
Hardness (as CaCO$_3$)[3]	mg L^{-1}	---	---	168	199	158	168	159	156
SAR[4]	---	---	---	1.0	1.0	1.0	0.9	0.9	0.9
Bacteria									
Total Coliforms	MPN/100mL	1000	3	23	<3	230	93	430	93
Fecal Coliforms	MPN/100mL	100	3	9	<3	93	15	4	9

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO$_4$+Cl+(Total Alkalinity*0.600)+(NO$_3$-N*4.427)

[3] Hardness (as CaCO$_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na$^+$ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.7 (continued) 2008 Water Quality Analyses – 1C Drain ditch sampling site									
Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.02	0.05	<0.02	0.12	0.08	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0019	0.0009	0.0011	0.0009	0.0006	0.0008
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0022	0.0019	0.0015	0.0015	0.0012	0.0012
Barium (Ba)	mg L^{-1}	---	0.0002	0.0624	0.0722	0.0546	0.0672	0.0566	0.0568
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	<0.02	0.02	<0.02	0.02	0.03	0.02
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	<0.001	0.003	<0.001	0.002	<0.001	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.070	0.112	0.031	0.198	0.057	0.026
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	0.0003	<0.0001	0.0003	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.024	0.030	0.020	0.018	0.011	0.013
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.016	0.018	0.008	0.030	0.012	0.006
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0010	0.0012	0.0011	0.0013	0.0014	0.0013
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0018	0.0020	0.0013	0.0018	0.0015	0.0015
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.0005	<0.0004
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.255	0.292	0.223	0.248	0.243	0.232
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	0.0021	0.0023	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0011	0.0016	0.0009	0.0011	0.0010	0.0009
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0008	0.0009	0.0005	0.0006	0.0006	0.0004
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	<0.004	<0.004	0.006	<0.004	<0.004

Appendix Table 4.7 (continued) 2008 Water Quality Analyses – 1C Drain ditch sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24		July 15		August 5	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	---	0.025	0.077	0.117	0.151	0.177	0.086	0.268
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	0.039	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	0.025*	**0.045**	**0.029**	**0.036**	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	--	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

* Detected with good peak values and minimal background noise but below stated quantifiable limit.

Appendix Table 4.8. 2008 Water Quality Analyses – Moon Lake Irrigation District INLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	—	0.05	<0.05	<0.05	0.07
Nitrate-N (NO_3-N)	mg L^{-1}	—	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	—	0.2	0.8	0.9	0.9
Total P	mg L^{-1}	—	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	—	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	—	1	35	31	29
Magnesium (Mg)	mg L^{-1}	—	0.1	28.3	28.2	28.5
Sodium (Na)	mg L^{-1}	—	1	48	49	49
Potassium (K)	mg L^{-1}	—	0.1	7.5	7.6	7.4
Chloride (Cl)	mg L^{-1}	100-700[6]	1	31	30	26
Sulfate (SO_4)	mg L^{-1}	—	4	111	115	116
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	161	152	140
Bicarbonate (HCO_3)	mg L^{-1}	---	5	196	185	136
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	17
pH	pH	---	0.1	8.3	8.1	8.9
Electrical Conductivity	uS cm^{-1}	---	10	640	610	570
Temperature (at sampling)	^0C	—	0.1	21.7	23.2	23.7
Turbidity Rating (1-5)[1]	—	—	—	1	2	1
Total Suspended Solids	mg L^{-1}	–	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	357	352	340
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	204	194	190
SAR[4]	—	—	—	1.5	1.5	1.6
Bacteria						
Total Coliforms	MPN/100mL	1000	3	430	23	43
Fecal Coliforms	MPN/100mL	100	3	43	23	4

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(Total\ Alkalinity*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.8 (continued). 2008 Water Quality Analyses – Moon Lake Irrigation District INLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	$mg\ L^{-1}$	5.0	0.02	<0.02	0.03	<0.02
Antimony (Sb)	$mg\ L^{-1}$	---	0.0004	0.0011	0.0010	0.0009
Arsenic (As)	$mg\ L^{-1}$	0.1	0.0004	0.0018	0.0018	0.0017
Barium (Ba)	$mg\ L^{-1}$	---	0.0002	0.104	0.0933	0.0621
Beryllium (Be)	$mg\ L^{-1}$	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	$mg\ L^{-1}$	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	$mg\ L^{-1}$	0.5-6.0[6]	0.02	0.05	0.05	0.06
Cadmium (Cd)	$mg\ L^{-1}$	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	$mg\ L^{-1}$	0.005-0.008	0.0008	0.0013	<0.0008	0.0010
Cobalt (Co)	$mg\ L^{-1}$	0.05	0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	$mg\ L^{-1}$	0.2-1.0[6]	0.001	0.001	0.002	<0.001
Iron (Fe)	$mg\ L^{-1}$	5.0	0.005	0.110	0.036	0.025
Lead (Pb)	$mg\ L^{-1}$	0.2	0.0001	0.0003	0.0001	0.0001
Lithium (Li)	$mg\ L^{-1}$	2.5	0.006	0.035	0.027	0.037
Manganese (Mn)	$mg\ L^{-1}$	0.2	0.001	0.054	0.040	0.025
Mercury (Hg)	$mg\ L^{-1}$	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	$mg\ L^{-1}$	0.01-0.05	0.0001	0.0008	0.0007	0.0008
Nickel (Ni)	$mg\ L^{-1}$	0.2	0.0002	0.0021	0.0013	0.0010
Selenium (Se)	$mg\ L^{-1}$	0.02-0.05	0.0004	0.0014	0.0007	0.0009
Sliver (Ag)	$mg\ L^{-1}$	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	$mg\ L^{-1}$	---	0.0002	0.319	0.271	0.261
Tellurium (Te)	$mg\ L^{-1}$	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	$mg\ L^{-1}$	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	$mg\ L^{-1}$	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	$mg\ L^{-1}$	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	$mg\ L^{-1}$	0.01	0.0001	0.0008	0.0007	0.0006
Vanadium (V)	$mg\ L^{-1}$	0.1	0.0002	0.0007	0.0006	0.0008
Zinc (Zn)	$mg\ L^{-1}$	1.0-5.0	0.004	<0.004	<0.004	<0.004

Appendix Table 4.8 (continued). 2008 Water Quality Analyses – Moon Lake Irrigation District INLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.079	0.067	0.060
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	0.0350	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	**0.043**	**0.026**	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 4.9. 2008 Water Quality Analyses – Moon Lake Irrigation District OUTLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	0.08
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.8	0.8	4.9
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	21	17	21
Magnesium (Mg)	mg L^{-1}	---	0.1	23.4	19.4	21.7
Sodium (Na)	mg L^{-1}	---	1	41	36	36
Potassium (K)	mg L^{-1}	---	0.1	4.9	4.7	5.0
Chloride (Cl)	mg L^{-1}	100-700[6]	1	22	18	14
Sulfate (SO_4)	mg L^{-1}	---	4	83	75	76
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	129	107	122
Bicarbonate (HCO_3)	mg L^{-1}	---	5	157	130	53
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	47
pH	pH	---	0.1	7.9	7.8	9.4
Electrical Conductivity	uS cm^{-1}	---	10	510	420	420
Temperature (at sampling)	^{0}C	---	0.1	19.0	21.9	26.1
Turbidity Rating (1-5)[1]	---	---	---	1	1	4
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	30
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	273	234	247
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	149	122	142
SAR[4]	---	---	---	1.5	1.4	1.3
Bacteria						
Total Coliforms	MPN/100mL	1000	3	130	430	93
Fecal Coliforms	MPN/100mL	100	3	93	28	93

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na$^+$ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.9 (continued). 2008 Water Quality Analyses – Moon Lake Irrigation District OUTLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	<0.02	<0.02	0.05
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0017	0.0009	0.0009
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0020	0.0017	0.0029
Barium (Ba)	mg L^{-1}	---	0.0002	0.0816	0.0528	0.0586
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.06	0.04	0.05
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0010	<0.0008	0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	0.0003
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	<0.001	0.001	<0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.070	0.080	0.365
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	<0.0001	0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.029	0.017	0.022
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.013	0.007	0.578
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0006	0.0004	0.0006
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0016	0.0009	0.0011
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0012	<0.0004	0.0006
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.242	0.156	0.190
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0004	0.0002	0.0002
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0006	0.0003	0.0008
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	<0.004	0.005

Appendix Table 4.9 (continued). 2008 Water Quality Analyses – Moon Lake Irrigation District OUTLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.065	0.086	0.034
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	0.021*	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	**0.107**	**0.029**	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

[*] Detected with good peak values and minimal background noise but below stated quantifiable limit.

Appendix Table 4.10. 2008 Water Quality Analyses – Brightwater Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	0.07
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.5	0.5	0.6
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	0.04
Calcium (Ca)	mg L^{-1}	---	1	36	34	33
Magnesium (Mg)	mg L^{-1}	---	0.1	19.5	19.3	19.0
Sodium (Na)	mg L^{-1}	---	1	28	29	29
Potassium (K)	mg L^{-1}	---	0.1	4.3	4.1	3.9
Chloride (Cl)	mg L^{-1}	100-700[6]	1	10	11	10
Sulfate (SO_4)	mg L^{-1}	---	4	80	79	75
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	145	142	130
Bicarbonate (HCO_3)	mg L^{-1}	---	5	133	122	124
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	22	25	17
pH	pH	---	0.1	8.7	8.8	9.0
Electrical Conductivity	uS cm^{-1}	---	10	470	450	420
Temperature (at sampling)	^{0}C	---	0.1	19.1	19.4	21.6
Turbidity Rating (1-5)[1]	---	---	---	2	1	1
Total Suspended Solids	mg L^{-1}	–	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	265	262	248
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	170	164	161
SAR[4]	---	---	---	0.9	1.0	1.0
Bacteria						
Total Coliforms	MPN/100mL	1000	3	43	430	16
Fecal Coliforms	MPN/100mL	100	3	4	4	<3

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.10 (continued). 2008 Water Quality Analyses – Brightwater Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.11	0.07	0.08
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0011	0.0009	0.0009
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0016	0.0021	0.0031
Barium (Ba)	mg L^{-1}	---	0.0002	0.0640	0.0566	0.0625
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.04	0.03	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	0.0009
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0003	0.0002	0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.002	0.002	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.192	0.101	0.128
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0001	<0.0001	0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.017	0.013	0.012
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.030	0.017	0.019
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0015	0.0015
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0029	0.0020	0.0022
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0011	<0.0004	0.0008
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.263	0.232	0.247
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0014	0.0011	0.0012
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0010	0.0006	0.0011
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	<0.004	<0.004

Appendix Table 4.10 (continued). 2008 Water Quality Analyses – Brightwater Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.110	0.091	0.077
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	0.023*	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	**0.028**	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

* Detected with good peak values and minimal background noise but below stated quantifiable limit.

Appendix Table 4.11. 2008 Water Quality Analyses – Blackstrap Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	0.08
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.6	0.8	0.8
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	56	55	57
Magnesium (Mg)	mg L^{-1}	---	0.1	42.1	42.4	43.7
Sodium (Na)	mg L^{-1}	---	1	68	69	72
Potassium (K)	mg L^{-1}	---	0.1	8.2	8.6	9.2
Chloride (Cl)	mg L^{-1}	100-700[6]	1	18	18	18
Sulfate (SO_4)	mg L^{-1}	---	4	246	261	265
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	184	174	171
Bicarbonate (HCO_3)	mg L^{-1}	---	5	197	192	208
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	13	10	<5
pH	pH	---	0.1	8.5	8.6	8.7
Electrical Conductivity	uS cm^{-1}	---	10	900	880	860
Temperature (at sampling)	^0C	---	0.1	19.1	20.3	21.1
Turbidity Rating (1-5)[1]	---	---	---	1	1	1
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	549	558	568
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	313	312	322
SAR[4]	---	---	---	1.7	1.7	1.7
Bacteria						
Total Coliforms	MPN/100mL	1000	3	21	4	43
Fecal Coliforms	MPN/100mL	100	3	4	<3	<3

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.11 (continued). 2008 Water Quality Analyses – Blackstrap Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	$mg\ L^{-1}$	5.0	0.02	0.03	0.03	<0.02
Antimony (Sb)	$mg\ L^{-1}$	—	0.0004	0.0012	0.0010	0.0009
Arsenic (As)	$mg\ L^{-1}$	0.1	0.0004	0.0019	0.0020	0.0030
Barium (Ba)	$mg\ L^{-1}$	—	0.0002	0.0979	0.0850	0.0631
Beryllium (Be)	$mg\ L^{-1}$	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	$mg\ L^{-1}$	—	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	$mg\ L^{-1}$	0.5-6.0[6]	0.02	0.10	0.09	0.10
Cadmium (Cd)	$mg\ L^{-1}$	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	$mg\ L^{-1}$	0.005-0.008	0.0008	0.0010	<0.0008	0.0011
Cobalt (Co)	$mg\ L^{-1}$	0.05	0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	$mg\ L^{-1}$	0.2-1.0[6]	0.001	0.002	0.002	0.001
Iron (Fe)	$mg\ L^{-1}$	5.0	0.005	0.035	0.039	0.029
Lead (Pb)	$mg\ L^{-1}$	0.2	0.0001	<0.0001	<0.0001	<0.0001
Lithium (Li)	$mg\ L^{-1}$	2.5	0.006	0.058	0.045	0.067
Manganese (Mn)	$mg\ L^{-1}$	0.2	0.001	0.010	0.014	0.015
Mercury (Hg)	$mg\ L^{-1}$	—	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	$mg\ L^{-1}$	0.01-0.05	0.0001	0.0028	0.0026	0.0027
Nickel (Ni)	$mg\ L^{-1}$	0.2	0.0002	0.0032	0.0021	0.0018
Selenium (Se)	$mg\ L^{-1}$	0.02-0.05	0.0004	0.0017	<0.0004	0.0008
Sliver (Ag)	$mg\ L^{-1}$	—	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	$mg\ L^{-1}$	—	0.0002	0.452	0.379	0.410
Tellurium (Te)	$mg\ L^{-1}$	—	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	$mg\ L^{-1}$	—	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	$mg\ L^{-1}$	—	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	$mg\ L^{-1}$	—	0.005	<0.005	<0.005	<0.005
Uranium (U)	$mg\ L^{-1}$	0.01	0.0001	0.0022	0.0019	0.0013
Vanadium (V)	$mg\ L^{-1}$	0.1	0.0002	0.0016	0.0012	0.0015
Zinc (Zn)	$mg\ L^{-1}$	1.0-5.0	0.004	<0.004	0.004	0.005

Appendix Table 4.11 (continued). 2008 Water Quality Analyses – Blackstrap Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.030	<0.025	0.023*
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

* Detected with good peak values and minimal background noise but below stated quantifiable limit.

Appendix Table 4.12. 2008 Water Quality Analyses – Bradwell Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	0.09
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.9	0.8	2.0
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	59	55	46
Magnesium (Mg)	mg L^{-1}	---	0.1	44.6	46.1	47.1
Sodium (Na)	mg L^{-1}	---	1	68	72	75
Potassium (K)	mg L^{-1}	---	0.1	10.2	10.5	11.1
Chloride (Cl)	mg L^{-1}	100-700[6]	1	19	19	19
Sulfate (SO_4)	mg L^{-1}	---	4	249	274	283
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	197	187	154
Bicarbonate (HCO_3)	mg L^{-1}	---	5	207	192	126
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	16	18	30
pH	pH	---	0.1	8.5	8.7	9.0
Electrical Conductivity	uS cm^{-1}	---	10	940	920	880
Temperature (at sampling)	^{0}C	---	0.1	21.0	20.6	21.8
Turbidity Rating (1-5)[1]	---	---	---	1	1	3
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	20
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	568	589	574
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	331	327	309
SAR[4]	---	---	---	1.6	1.7	1.9
Bacteria						
Total Coliforms	MPN/100mL	1000	3	<3	9	38
Fecal Coliforms	MPN/100mL	100	3	<3	4	23

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.12 (continued). 2008 Water Quality Analyses – Bradwell Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.02	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0015	0.0010	0.0008
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0023	0.0023	0.0030
Barium (Ba)	mg L^{-1}	---	0.0002	0.1100	0.0910	0.0606
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.11	0.10	0.14
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0009	<0.0008	0.0009
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.002	0.002	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.051	0.028	0.029
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	<0.0001	0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.062	0.049	0.076
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.017	0.015	0.028
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0029	0.0024	0.0025
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0030	0.0017	0.0013
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0020	<0.0004	0.0007
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.521	0.433	0.435
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0019	0.0015	0.0013
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0016	0.0008	0.0014
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	<0.004	<0.004

Appendix Table 4.12 (continued). 2008 Water Quality Analyses – Bradwell Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.034	0.036	<0.025
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	**0.029**	0.025*	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

* Detected with good peak values and minimal background noise but below stated quantifiable limit.

Appendix Table 4.13. 2008 Water Quality Analyses – Lumsden-1 sampling site (upstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	—	0.2	0.4	0.7	0.5
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	35	31	35
Magnesium (Mg)	mg L^{-1}	---	0.1	20.5	20.5	22.3
Sodium (Na)	mg L^{-1}	---	1	41	42	42
Potassium (K)	mg L^{-1}	---	0.1	4.7	5.0	5.8
Chloride (Cl)	mg L^{-1}	100-700[6]	1	14	13	14
Sulfate (SO_4)	mg L^{-1}	---	4	101	104	109
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	144	134	143
Bicarbonate (HCO_3)	mg L^{-1}	---	5	176	128	174
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	17	<5
pH	pH	---	0.1	8.4	8.9	8.6
Electrical Conductivity	uS cm^{-1}	---	10	530	500	510
Temperature (at sampling)	^{0}C	---	0.1	21.0	22.0	22.0
Turbidity Rating (1-5)[1]	---	---	---	4	5	3
Total Suspended Solids	mg L^{-1}	--	10	70	40	20
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	303	296	314
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	172	162	179
SAR[4]	---	---	---	1.4	1.4	1.4
Bacteria						
Total Coliforms	MPN/100mL	1000	3	93	93	230
Fecal Coliforms	MPN/100mL	100	3	93	23	43

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^{+} (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.13 (continued). 2008 Water Quality Analyses – Lumsden-1 sampling site (upstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	1.85	1.25	0.41
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0013	0.0009	0.0009
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0025	0.0025	0.0032
Barium (Ba)	mg L^{-1}	—	0.0002	0.0948	0.0709	0.0709
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.06	0.05	0.05
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0033	0.0012	0.0013
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0011	0.0006	0.0005
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.004	0.004	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	2.35	1.47	0.642
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0015	0.0009	0.0006
Lithium (Li)	mg L^{-1}	2.5	0.006	0.023	0.018	0.020
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.084	0.052	0.061
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0017	0.0017	0.0021
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0047	0.0029	0.0027
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0014	0.0007	0.0010
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.259	0.227	0.263
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	0.046	0.027	0.013
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0022	0.0018	0.0017
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0067	0.0044	0.0027
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.011	0.007	0.005

Appendix Table 4.13 (continued). 2008 Water Quality Analyses – Lumsden-1 sampling site (upstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	—	0.025	0.036	<0.025	0.035
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025

Appendix Table 4.14. 2008 Water Quality Analyses – Lumsden-2 sampling site (downstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.05	0.18
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	0.9	<0.5	2.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.5	0.7	1.2
Total P	mg L^{-1}	---	0.2	<0.2	0.2	0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	0.05	0.02	0.13
Calcium (Ca)	mg L^{-1}	---	1	38	33	52
Magnesium (Mg)	mg L^{-1}	---	0.1	21.6	20.1	29.2
Sodium (Na)	mg L^{-1}	---	1	52	45	76
Potassium (K)	mg L^{-1}	---	0.1	5.9	5.7	8.9
Chloride (Cl)	mg L^{-1}	100-700[6]	1	28	21	52
Sulfate (SO_4)	mg L^{-1}	---	4	118	106	180
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	141	136	145
Bicarbonate (HCO_3)	mg L^{-1}	---	5	171	165	177
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5
pH	pH	---	0.1	8.1	8.4	8.3
Electrical Conductivity	uS cm^{-1}	---	10	620	530	780
Temperature (at sampling)	^0C	---	0.1	20.0	21.0	21.0
Turbidity Rating (1-5)[1]	---	---	---	4	4	4
Total Suspended Solids	mg L^{-1}	–	10	10	60	20
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	352	312	496
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	184	165	250
SAR[4]	---	---	---	1.7	1.5	2.1
Bacteria						
Total Coliforms	MPN/100mL	1000	3	210	430	430
Fecal Coliforms	MPN/100mL	100	3	43	**430**	93

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 4.14 (continued). 2008 Water Quality Analyses – Lumsden-2 sampling site (downstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 24	July 15	August 5
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	2.91	2.02	0.69
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0011	0.0009	0.0011
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0036	0.0033	0.0039
Barium (Ba)	mg L^{-1}	---	0.0002	0.105	0.0828	0.0710
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.08	0.07	0.12
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0048	0.0026	0.0028
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0018	0.0012	0.0008
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.005	0.005	0.003
Iron (Fe)	mg L^{-1}	5.0	0.005	3.79	2.54	1.00
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0022	0.0015	0.0008
Lithium (Li)	mg L^{-1}	2.5	0.006	0.027	0.021	0.034
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.133	0.084	0.069
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0056	0.0032	0.0083
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0068	0.0045	0.0057
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0017	0.0007	0.0020
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.272	0.239	0.312
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	0.069	0.045	0.023
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0022	0.0019	0.0019
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0226	0.0160	0.0222
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.015	0.011	0.008

Appendix Table 4.14 (continued). 2008 Water Quality Analyses – Lumsden-2 sampling site (downstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	**Units**	**Irrigation Guideline**[5]	**D.L.**[7]	**June 24**	**July 15**	**August 5**
				Grab Sample	**Grab Sample**	**Grab Sample**
Herbicides						
2,4-D	ug L^{-1}	—	0.025	0.069	0.230	0.186
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	**0.037**	**0.146**
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	0.029	0.081	0.059
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	0.124
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025

Appendix 5

2009 Water Quality Data

Appendix Table 5.1. 2009 Water Quality Analyses – Riverhurst Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.6	0.4	0.4
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	46	47	46
Magnesium (Mg)	mg L^{-1}	---	0.1	17.8	18.0	17.8
Sodium (Na)	mg L^{-1}	---	1	27	23	25
Potassium (K)	mg L^{-1}	---	0.1	3.2	2.5	3.0
Chloride (Cl)	mg L^{-1}	100-700[6]	1	12	10	10
Sulfate (SO_4)	mg L^{-1}	---	4	75	71	70
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	151	157	158
Bicarbonate (HCO_3)	mg L^{-1}	---	5	185	191	192
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5
pH	pH	---	0.1	8.5	8.5	8.5
Electrical Conductivity	uS cm^{-1}	---	10	470	463	460
Temperature (at sampling)	^0C	---	0.1	15.0	18.0	17.0
Turbidity Rating (1-5)[1]	---	---	---	4	3	3
Total Suspended Solids	mg L^{-1}	--	10	191	17	12
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	270	266	266
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	187	191	187
SAR[4]	—	---	---	0.9	0.7	0.8
Bacteria						
Total Coliforms	MPN/100mL	1000	3	93	230	430
Fecal Coliforms	MPN/100mL	100	3	93	29	**150**

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = $Ca\ (mg\ L^{-1})*2.5 + Mg\ (mg\ L^{-1})*4.12$

[4] Sodium Adsorption Ratio = $Na^+\ (meq\ L^{-1})/[[Ca^{++}\ (meq\ L^{-1}) + Mg^{++}\ (meq\ L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.1 (continued). 2009 Water Quality Analyses – Riverhurst Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	2.36	0.21	0.27
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0006	0.0005	0.0007
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0024	0.0008	0.0009
Barium (Ba)	mg L^{-1}	---	0.0002	0.1210	0.0742	0.0841
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.03	0.02	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0045	<0.0008	0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0019	0.0003	0.0003
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.006	0.002	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	4.000	0.393	0.326
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0020	0.0004	0.0003
Lithium (Li)	mg L^{-1}	2.5	0.006	0.013	0.010	0.010
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.100	0.011	0.011
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0018	0.0015	0.0015
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0072	0.0029	0.0022
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0009	0.0006	0.0007
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.286	0.255	0.278
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	0.080	0.008	0.011
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0016	0.0013	0.0013
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0080	0.0010	0.0011
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.024	0.011	0.009

Appendix Table 5.1 (continued). 2009 Water Quality Analyses – Riverhurst Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	—	0.025	0.059	0.058	0.053
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025

Appendix Table 5.2. 2009 Water Quality Analyses – Luck Lake Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	—	0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	—	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	—	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	—	0.2	0.7	0.4	0.5
Total P	mg L^{-1}	—	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	—	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	—	1	46	47	45
Magnesium (Mg)	mg L^{-1}	—	0.1	17.5	17.9	17.7
Sodium (Na)	mg L^{-1}	—	1	22	22	24
Potassium (K)	mg L^{-1}	—	0.1	2.3	2.4	2.7
Chloride (Cl)	mg L^{-1}	100-700[6]	1	8	9	9
Sulfate (SO_4)	mg L^{-1}	—	4	66	69	69
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	—	5	164	161	155
Bicarbonate (HCO_3)	mg L^{-1}	—	5	200	197	188
Hydroxide (OH)	mg L^{-1}	—	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	—	5	<5	<5	<5
pH	pH	—	0.1	8.3	8.3	8.5
Electrical Conductivity	uS cm^{-1}	—	10	461	455	456
Temperature (at sampling)	^{0}C	—	0.1	12.0	16.0	15.0
Turbidity Rating (1-5)[1]	—	—	—	4	3	3
Total Suspended Solids	mg L^{-1}	–	10	62	<10	43
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	—	261	264	261
Hardness (as $CaCO_3$)[3]	mg L^{-1}	—	—	187	192	186
SAR[4]	—	—	—	0.7	0.7	0.8
Bacteria						
Total Coliforms	MPN/100mL	1000	3	93	93	93
Fecal Coliforms	MPN/100mL	100	3	15	4	21

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.2 (continued). 2009 Water Quality Analyses – Luck Lake Pump Station sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.94	0.10	0.74
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0007	0.0005	0.0006
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0014	0.0008	0.0012
Barium (Ba)	mg L^{-1}	—	0.0002	0.0898	0.0756	0.0890
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.02	0.02	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0021	<0.0008	0.0014
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0008	0.0002	0.0005
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.004	0.002	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	1.480	0.194	0.864
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0008	0.0002	0.0005
Lithium (Li)	mg L^{-1}	2.5	0.006	0.010	0.009	0.011
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.036	0.008	0.024
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0015	0.0015
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0041	0.0027	0.0029
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0009	0.0006	0.0007
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.280	0.253	0.275
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	0.0005
Titanium (Ti)	mg L^{-1}	—	0.005	0.032	<0.005	0.028
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0012	0.0013	0.0014
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0036	0.0007	0.0028
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.012	<0.004	0.005

Appendix Table 5.2 (continued). 2009 Water Quality Analyses – Luck Lake Pump Station sampling site						
Parameter	**Units**	**Irrigation Guideline[5]**	**D.L.[7]**	**June 23**	**July 21**	**August 11**
				Grab Sample	**Grab Sample**	**Grab Sample**
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.036	0.059	0.041
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 5.3. 2009 Water Quality Analyses – M1 Main Canal sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	$mg\ L^{-1}$	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	$mg\ L^{-1}$	---	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	$mg\ L^{-1}$	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	$mg\ L^{-1}$	---	0.2	0.4	0.4	0.4	0.5	0.4	0.4
Total P	$mg\ L^{-1}$	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	$mg\ L^{-1}$	---	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	$mg\ L^{-1}$	---	1	46	47	48	43	44	45
Magnesium (Mg)	$mg\ L^{-1}$	---	0.1	17.5	17.9	18.1	17.1	17.7	17.6
Sodium (Na)	$mg\ L^{-1}$	---	1	22	23	22	21	24	23
Potassium (K)	$mg\ L^{-1}$	---	0.1	2.5	2.6	2.4	2.6	2.7	2.6
Chloride (Cl)	$mg\ L^{-1}$	100-700[6]	1	8	8	9	8	9	8
Sulfate (SO_4)		---	4	64	66	67	65	66	66
Alkalinity, Total (as $CaCO_3$)	$mg\ L^{-1}$	---	5	167	164	162	151	154	153
Bicarbonate (HCO_3)	$mg\ L^{-1}$	---	5	204	200	198	184	188	186
Hydroxide (OH)	$mg\ L^{-1}$	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	$mg\ L^{-1}$	---	5	<5	<5	<5	<5	<5	<5
pH	pH	---	0.1	8.4	8.5	8.2	8.4	8.4	8.3
Electrical Conductivity	$uS\ cm^{-1}$	---	10	458	462	460	436	440	446
Temperature (at sampling)	^0C	---	0.1	17.8	17.6	14.5	19.7	22.3	22.4
Turbidity Rating (1-5)[1]	---	---	---	2	-	1	-	1	-
Total Suspended Solids	$mg\ L^{-1}$	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	$mg\ L^{-1}$	500-3500[6]	---	260	262	263	248	255	255
Hardness (as $CaCO_3$)[3]	$mg\ L^{-1}$	---	---	186	190	194	179	182	185
SAR[4]	---	---	---	0.7	0.7	0.7	0.7	0.8	0.7
Bacteria									
Total Coliforms	MPN/100mL	1000	3	43	93	93	43	11	4
Fecal Coliforms	MPN/100mL	100	3	<3	23	<3	<3	4	4

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = $Ca\ (mg\ L^{-1})*2.5 + Mg\ (mg\ L^{-1})*4.12$

[4] Sodium Adsorption Ratio = $Na^+\ (meq/L)/[[Ca^{++}\ (meq/L) + Mg^{++}\ (meq/L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.3 (continued) 2009 Water Quality Analyses – M1 Main Canal sampling site									
Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.12	0.11	<0.02	0.03	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0005	0.0005	0.0005	0.0005	0.0006	0.0006
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008
Barium (Ba)	mg L^{-1}	---	0.0002	0.0840	0.0848	0.0714	0.0695	0.0779	0.0788
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.02	0.03	0.02	0.02	0.03	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.002	0.002	0.001	0.002	0.001	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	0.252	0.237	0.025	0.055	0.023	0.019
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0002	0.0002	0.0001	<0.0001	<0.0001	0.0002
Lithium (Li)	mg L^{-1}	2.5	0.006	0.007	0.008	0.011	0.010	0.010	0.010
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.008	0.007	0.004	0.003	0.010	0.002
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0016	0.0015	0.0014	0.0014	0.0015
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0024	0.0025	0.0022	0.0023	0.0017	0.0018
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0008	0.0007	0.0007	0.0006	0.0005	0.0005
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.288	0.289	0.264	0.239	0.265	0.267
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0014	0.0014	0.0013	0.0012	0.0012	0.0012
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0007	0.0007	<0.0005	0.0006	<0.0005	<0.0005
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.005	0.004	0.007	0.028	<0.004	0.010

Appendix Table 5.3 (continued) 2009 Water Quality Analyses – M1 Main Canal sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	---	0.025	0.037	0.047	0.039	0.048	0.057	0.054
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	--	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 5.4. 2009 Water Quality Analyses – M2 Canal START sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.4	0.5	0.5	0.5	0.5	0.3
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	38	39	33	34	35	34
Magnesium (Mg)	mg L^{-1}	---	0.1	17.7	18.3	17.7	17.7	17.4	17.5
Sodium (Na)	mg L^{-1}	---	1	23	24	22	22	23	23
Potassium (K)	mg L^{-1}	---	0.1	2.6	2.7	2.3	2.3	2.5	2.5
Chloride (Cl)	mg L^{-1}	100-700[6]	1	8	8	9	8	8	8
Sulfate (SO_4)	mg L^{-1}	---	4	66	68	66	67	65	66
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	147	149	129	132	127	130
Bicarbonate (HCO_3)	mg L^{-1}	---	5	180	182	158	162	155	158
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
pH	pH	---	0.1	8.4	8.5	8.5	8.4	8.3	8.3
Electrical Conductivity	uS cm^{-1}	---	10	428	438	397	409	402	404
Temperature (at sampling)	^{0}C	---	0.1	18.4	18.0	19.7	20.1	18.6	21.2
Turbidity Rating (1-5)[1]	---	---	---	1	-	1	-	1	-
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	244	250	226	231	228	229
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	168	173	155	158	159	156
SAR[4]	---	---	---	0.8	0.8	0.8	0.8	0.8	0.8
Bacteria									
Total Coliforms	MPN/100mL	1000	3	<3	<3	93	15	43	15
Fecal Coliforms	MPN/100mL	100	3	<3	<3	7	9	43	<3

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^{+} (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.4 (continued) 2009 Water Quality Analyses – M2 Canal START sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0006	0.0007	0.0006	0.0006	0.0006	0.0005
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0009	0.0008	0.0010	0.0010	0.0009	0.0009
Barium (Ba)	mg L^{-1}	—	0.0002	0.0739	0.0748	0.0579	0.0592	0.0662	0.0641
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.03	0.03	0.02	0.02	0.03	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	0.004	0.001	0.002	<0.001	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.077	0.050	0.042	0.025	0.025	0.014
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.008	0.009	0.010	0.010	0.010	0.010
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.019	0.010	0.011	0.006	0.011	0.006
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0016	0.0014	0.0014	0.0014	0.0014
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0020	0.0021	0.0018	0.0018	0.0015	0.0014
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0006	0.0006	0.0005	0.0006	<0.0004	0.0005
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.270	0.282	0.226	0.232	0.233	0.231
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0004	0.0004	<0.0005	<0.0005	<0.0005	<0.0005
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	0.004	<0.004	0.014	<0.004	0.004

Appendix Table 5.4 (continued) 2009 Water Quality Analyses – M2 Canal START sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	---	0.025	0.043	0.045	0.057	0.061	0.044	0.041
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	**0.026**	**0.032**	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	--	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 5.5. 2009 Water Quality Analyses – M2 Canal MID sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.05	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.4	0.6	0.4	0.4	0.5	0.4
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	38	38	35	36	29	33
Magnesium (Mg)	mg L^{-1}	---	0.1	17.1	18.1	18.1	18.9	18.2	17.6
Sodium (Na)	mg L^{-1}	---	1	22	24	22	23	24	23
Potassium (K)	mg L^{-1}	---	0.1	2.3	2.6	2.3	2.4	2.5	2.6
Chloride (Cl)	mg L^{-1}	100-700[6]	1	8	8	9	9	9	8
Sulfate (SO_4)	mg L^{-1}	---	4	67	68	69	74	70	66
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	150	141	133	136	115	125
Bicarbonate (HCO_3)	mg L^{-1}	---	5	183	172	163	166	140	152
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
pH	pH	---	0.1	8.5	8.4	8.5	8.4	8.5	8.3
Electrical Conductivity	uS cm^{-1}	---	10	434	429	411	425	390	401
Temperature (at sampling)	^0C	---	0.1	19.1	17.6	21.6	19.7	22.8	21.2
Turbidity Rating (1-5)[1]	---	---	---	1	-	1	-	1	-
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	244	243	234	244	222	226
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	164	169	161	167	148	154
SAR[4]	---	---	---	0.7	0.8	0.8	0.8	0.9	0.8
Bacteria									
Total Coliforms	MPN/100mL	1000	3	43	15	93	23	4	<3
Fecal Coliforms	MPN/100mL	100	3	9	3	28	23	4	<3

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.5 (continued) 2009 Water Quality Analyses – M2 Canal MID sampling site									
Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0006	0.0006	0.0006	0.0004	0.0006	0.0005
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0008	0.0008	0.0009	0.0010	0.0011	0.0009
Barium (Ba)	mg L^{-1}	—	0.0002	0.0727	0.0726	0.0591	0.0591	0.0564	0.0605
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.02	0.03	0.02	0.02	0.03	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	0.001	<0.001	0.001	<0.001	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.037	0.025	0.024	0.030	<0.010	0.017
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.010	0.010	0.011	0.012	0.011	0.011
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.006	0.004	0.004	0.006	0.013	0.005
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0016	0.0016	0.0014	0.0014	0.0013	0.0014
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0019	0.0019	0.0017	0.0017	0.0014	0.0014
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0006	0.0006	0.0005	0.0005	<0.0004	<0.0004
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.275	0.276	0.235	0.244	0.220	0.229
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0014	0.0013	0.0013	0.0016	0.0013	0.0012
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0038	0.0003	<0.0005	<0.0005	<0.0005	<0.0005
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	<0.004	<0.004	0.020	<0.004	<0.004

Appendix Table 5.5 (continued) 2009 Water Quality Analyses – M2 Canal MID sampling site

Parameter	Units	Irrigation Guideline^5	D.L.^{7}	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	---	0.025	0.047	0.050	0.044	0.077	1.256	0.417
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	--	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 5.6. 2009 Water Quality Analyses – M2 Canal END sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.11	<0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.5	0.7	0.5	0.4	0.6	0.5
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	38	39	33	34	31	34
Magnesium (Mg)	mg L^{-1}	---	0.1	18.0	18.8	18.9	19.1	17.7	17.6
Sodium (Na)	mg L^{-1}	---	1	23	25	23	23	24	23
Potassium (K)	mg L^{-1}	---	0.1	2.6	2.8	2.2	2.3	2.5	2.5
Chloride (Cl)	mg L^{-1}	100-700[6]	1	8	9	9	9	8	8
Sulfate (SO_4)	mg L^{-1}	---	4	67	69	71	72	66	66
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	144	145	131	133	120	129
Bicarbonate (HCO_3)	mg L^{-1}	---	5	175	177	159	162	147	157
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5	<5	<5	<5
pH	pH	---	0.1	8.6	8.4	8.8	8.4	8.5	8.3
Electrical Conductivity	uS cm^{-1}	---	10	424	440	406	422	391	405
Temperature (at sampling)	^{0}C	---	0.1	20.7	19.9	22.8	21.7	23.6	23.4
Turbidity Rating (1-5)[1]	---	---	---	1	-	1	-	1	-
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	244	249	235	239	221	230
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	169	175	160	164	149	157
SAR[4]	---	---	---	0.8	0.8	0.8	0.8	0.9	0.8
Bacteria									
Total Coliforms	MPN/100mL	1000	3	210	43	230	150	380	150
Fecal Coliforms	MPN/100mL	100	3	43	15	4	9	15	3

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.6 (continued) 2009 Water Quality Analyses – M2 Canal END sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.05	0.02	<0.02	<0.02	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0005	0.0006	0.0005	0.0004	0.0006	0.0005
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0009	0.0010	0.0010	0.0011	0.0010	0.0009
Barium (Ba)	mg L^{-1}	—	0.0002	0.0732	0.0752	0.0552	0.0571	0.0606	0.0640
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.02	0.03	0.02	0.03	0.03	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	0.001	0.001	0.001	<0.001	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.094	0.065	0.016	0.025	0.026	0.027
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.010	0.011	0.012	0.012	0.011	0.010
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.013	0.008	0.003	0.003	0.007	0.003
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0015	0.0016	0.0014	0.0014	0.0014	0.0014
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0019	0.0022	0.0017	0.0015	0.0014	0.0015
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0006	0.0006	0.0004	0.0004	<0.0004	<0.0004
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.275	0.283	0.238	0.244	0.218	0.232
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0012	0.0013	0.0014	0.0014	0.0010	0.0012
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0004	0.0004	<0.0005	<0.0005	<0.0005	<0.0005
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.009	0.008	0.007	0.013	<0.004	0.005

Appendix Table 5.6 (continued) 2009 Water Quality Analyses – M2 Canal END sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	---	0.025	0.049	0.061	0.094	0.160	0.536	2.162
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	--	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Insecticides									
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 5.7. 2009 Water Quality Analyses – 1C Drain ditch sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Nutrients & Chemical									
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.9	1.0	0.7	0.7	0.5	0.5
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	0.04	0.03	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	42	41	21	25	33	32
Magnesium (Mg)	mg L^{-1}	---	0.1	21.1	21.7	20.6	21.2	19.1	18.6
Sodium (Na)	mg L^{-1}	---	1	25	27	25	24	24	23
Potassium (K)	mg L^{-1}	---	0.1	3.4	3.9	2.3	2.1	2.9	2.7
Chloride (Cl)	mg L^{-1}	100-700[6]	1	9	9	9	8	8	8
Sulfate (SO_4)	mg L^{-1}	---	4	75	77	75	74	65	66
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	164	164	116	119	132	129
Bicarbonate (HCO_3)	mg L^{-1}	---	5	200	200	<5	145	99	157
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	28	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	20	<5	31	<5
pH	pH	---	0.1	8.8	8.4	9.8	8.7	8.7	8.3
Electrical Conductivity	uS cm^{-1}	---	10	476	788	383	397	403	407
Temperature (at sampling)	^{0}C	---	0.1	20.8	20.7	23.4	21.3	23.9	22.2
Turbidity Rating (1-5)[1]	---	---	---	1	-	1	-	1	-
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	273	277	221	225	231	228
Hardness (as $CaCO_3$) [3]	mg L^{-1}	---	---	191	192	137	149	161	157
SAR[4]	---	---	---	0.8	0.9	0.9	0.9	0.8	0.8
Bacteria									
Total Coliforms	MPN/100mL	1000	3	230	4	15	93	430	93
Fecal Coliforms	MPN/100mL	100	3	4	<3	9	23	23	15

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq/L)/[[Ca^{++} (meq/L) + Mg^{++} (meq/L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.7 (continued) 2009 Water Quality Analyses – 1C Drain ditch sampling site

Parameter	Units	Irrigation Guideline^5	D.L.^{7}	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Metals									
Aluminum (Al)	mg L^{-1}	5.0	0.02	<0.02	0.04	<0.02	0.02	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0006	0.0005	0.0005	0.0005	0.0006	0.0006
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0013	0.0015	0.0013	0.0012	0.0009	0.0009
Barium (Ba)	mg L^{-1}	---	0.0002	0.0833	0.0906	0.0460	0.0488	0.0650	0.0623
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0^6	0.02	0.03	0.03	0.02	0.02	0.03	0.02
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0^6	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.084	0.122	0.041	0.032	0.025	0.024
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	0.0002	<0.0001	<0.0001	0.0002	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.014	0.015	0.016	0.016	0.012	0.011
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.006	0.023	0.007	0.005	0.006	0.003
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0014	0.0015	0.0010	0.0010	0.0011	0.0012
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0019	0.0020	0.0012	0.0012	0.0012	0.0012
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0006	0.0006	<0.0004	0.0004	<0.0004	<0.0004
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.303	0.313	0.205	0.213	0.244	0.243
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0010	0.0011	0.0007	0.0008	0.0009	0.0009
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0004	0.0004	0.0006	<0.0005	<0.0005	<0.0005
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	0.008	<0.004	0.011	0.007	0.006

Appendix Table 5.7 (continued) 2009 Water Quality Analyses – 1C Drain ditch sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23		July 21		August 11	
				Grab Sample	Auto Sampler	Grab Sample	Auto Sampler	Grab Sample	Auto Sampler
Herbicides									
2,4-D	ug L^{-1}	---	0.025	0.048	0.060	0.090	0.159	0.274	0.138
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	--	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix Table 5.8. 2009 Water Quality Analyses – Moon Lake Irrigation District INLET sampling site

Parameter	**Units**	**Irrigation Guideline**[5]	**D.L.**[7]	**June 23**	**July 21**	**August 11**
				Grab Sample	**Grab Sample**	**Grab Sample**
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	1.0	0.9	0.8
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	34	35	33
Magnesium (Mg)	mg L^{-1}	---	0.1	21.6	22.6	21.5
Sodium (Na)	mg L^{-1}	---	1	30	30	30
Potassium (K)	mg L^{-1}	---	0.1	4.4	4.6	3.9
Chloride (Cl)	mg L^{-1}	100-700[6]	1	14	14	11
Sulfate (SO_4)	mg L^{-1}	---	4	78	78	74
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	154	152	141
Bicarbonate (HCO_3)	mg L^{-1}	---	5	187	186	172
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5
pH	pH	---	0.1	8.4	8.6	8.5
Electrical Conductivity	uS cm^{-1}	---	10	486	476	446
Temperature (at sampling)	^0C	---	0.1	21.5	19.5	21.1
Turbidity Rating (1-5)[1]	---	---	---	2	2	1
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	274	274	257
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	173	179	170
SAR[4]	---	---	---	1.0	1.0	1.0
Bacteria						
Total Coliforms	MPN/100mL	1000	3	430	230	430
Fecal Coliforms	MPN/100mL	100	3	15	7	43

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = $Na^+ (meq\ L^{-1})/[[Ca^{++} (meq\ L^{-1}) + Mg^{++} (meq\ L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.8 (continued). 2009 Water Quality Analyses – Moon Lake Irrigation District INLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.06	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0006	0.0006	0.0004
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0012	0.0010	0.0010
Barium (Ba)	mg L^{-1}	---	0.0002	0.0921	0.0818	0.0855
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.04	0.04	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0012	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.002	<0.001	<0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.486	0.043	0.04
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0015	0.0002	<0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.017	0.016	0.015
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.022	0.031	0.042
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0011	0.0009	0.0009
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0020	0.0016	0.0011
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0005	<0.0004	<0.0004
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.291	0.259	0.270
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0006	0.0006	0.0006
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0005	<0.0005	<0.0005
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.009	0.006	<0.004

Appendix Table 5.8 (continued). 2009 Water Quality Analyses – Moon Lake Irrigation District INLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.029	0.079	0.041
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	0.023*	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

* Detected with good peak values and minimal background noise but below stated quantifiable limit.

Appendix Table 5.9. 2009 Water Quality Analyses – Moon Lake Irrigation District OUTLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	1.3	0.6	0.8
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	0.03	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	19	21	21
Magnesium (Mg)	mg L^{-1}	---	0.1	18.8	18.6	19.1
Sodium (Na)	mg L^{-1}	---	1	31	25	26
Potassium (K)	mg L^{-1}	---	0.1	5.1	2.7	3.5
Chloride (Cl)	mg L^{-1}	100-700[6]	1	14	9	9
Sulfate (SO_4)	mg L^{-1}	---	4	63	65	65
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	122	104	108
Bicarbonate (HCO_3)	mg L^{-1}	---	5	149	127	132
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5
pH	pH	---	0.1	8.2	7.7	7.3
Electrical Conductivity	uS cm^{-1}	---	10	408	369	383
Temperature (at sampling)	^{0}C	---	0.1	18.5	23.0	23.6
Turbidity Rating (1-5)[1]	---	---	---	1	2	1
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	225	204	209
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	125	130	131
SAR[4]	---	---	---	1.2	1.0	1.0
Bacteria						
Total Coliforms	MPN/100mL	1000	3	**9300**	430	198
Fecal Coliforms	MPN/100mL	100	3	93	**230**	**150**

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.9 (continued). 2009 Water Quality Analyses – Moon Lake Irrigation District OUTLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	<0.02	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0005	0.0004	0.0005
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0025	0.0010	0.0009
Barium (Ba)	mg L^{-1}	---	0.0002	0.0465	0.0446	0.0590
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.04	0.03	0.03
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	<0.001	<0.001	<0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.083	0.052	0.049
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	0.0001	0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.018	0.011	0.012
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.014	0.006	0.012
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0006	0.0007	0.0008
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0013	0.0009	0.0009
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0004	<0.0004	<0.0004
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.171	0.181	0.197
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0003	0.0002	0.0002
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0005	<0.0005	<0.0005
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	<0.004	0.007

Appendix Table 5.9 (continued). 2009 Water Quality Analyses – Moon Lake Irrigation District OUTLET sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	—	0.025	0.031	0.024*	<0.025
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	0.015*	<0.025
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025

* Detected with good peak values and minimal background noise but below stated quantifiable limit.

Appendix Table 5.10. 2009 Water Quality Analyses – Brightwater Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	0.06	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	0.8	0.8	1.9
Total P	mg L^{-1}	---	0.2	<0.2	0.2	0.6
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	0.05	0.12	0.25
Calcium (Ca)	mg L^{-1}	---	1	34	34	30
Magnesium (Mg)	mg L^{-1}	---	0.1	18.2	20.6	20.4
Sodium (Na)	mg L^{-1}	---	1	26	32	34
Potassium (K)	mg L^{-1}	---	0.1	4.8	6.8	6.6
Chloride (Cl)	mg L^{-1}	100-700[6]	1	9	11	9
Sulfate (SO_4)	mg L^{-1}	---	4	78	97	97
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	133	136	124
Bicarbonate (HCO_3)	mg L^{-1}	---	5	163	51	37
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	56	56
pH	pH	---	0.1	8.4	9.2	9.0
Electrical Conductivity	uS cm^{-1}	---	10	441	469	455
Temperature (at sampling)	^0C	---	0.1	18.0	18.5	21.0
Turbidity Rating (1-5)[1]	---	---	---	2	2	3
Total Suspended Solids	mg L^{-1}	--	10	16	<10	16
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	248	283	271
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	159	171	160
SAR[4]	---	---	---	0.9	1.1	1.2
Bacteria						
Total Coliforms	MPN/100mL	1000	3	210	4	23
Fecal Coliforms	MPN/100mL	100	3	43	<3	4

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = $Na^+ (\text{meq } L^{-1})/[[Ca^{++} (\text{meq } L^{-1}) + Mg^{++} (\text{meq } L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.10 (continued). 2009 Water Quality Analyses – Brightwater Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	$mg\ L^{-1}$	5.0	0.02	0.27	0.07	0.05
Antimony (Sb)	$mg\ L^{-1}$	---	0.0004	0.0005	0.0005	0.0006
Arsenic (As)	$mg\ L^{-1}$	0.1	0.0004	0.0020	0.0045	0.0055
Barium (Ba)	$mg\ L^{-1}$	---	0.0002	0.0651	0.0451	0.0436
Beryllium (Be)	$mg\ L^{-1}$	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	$mg\ L^{-1}$	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	$mg\ L^{-1}$	0.5-6.0[6]	0.02	0.03	0.04	0.05
Cadmium (Cd)	$mg\ L^{-1}$	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	$mg\ L^{-1}$	0.005-0.008	0.0008	0.0010	<0.0008	<0.0008
Cobalt (Co)	$mg\ L^{-1}$	0.05	0.0002	0.0004	0.0004	0.0003
Copper (Cu)	$mg\ L^{-1}$	0.2-1.0[6]	0.001	0.002	0.002	0.002
Iron (Fe)	$mg\ L^{-1}$	5.0	0.005	0.493	0.132	0.109
Lead (Pb)	$mg\ L^{-1}$	0.2	0.0001	0.0005	0.0002	0.0018
Lithium (Li)	$mg\ L^{-1}$	2.5	0.006	0.016	0.022	0.024
Manganese (Mn)	$mg\ L^{-1}$	0.2	0.001	0.034	0.040	0.034
Mercury (Hg)	$mg\ L^{-1}$	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	$mg\ L^{-1}$	0.01-0.05	0.0001	0.0016	0.0014	0.0013
Nickel (Ni)	$mg\ L^{-1}$	0.2	0.0002	0.0030	0.0024	0.0021
Selenium (Se)	$mg\ L^{-1}$	0.02-0.05	0.0004	0.0005	0.0005	0.0005
Sliver (Ag)	$mg\ L^{-1}$	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	$mg\ L^{-1}$	---	0.0002	0.246	0.206	0.207
Tellurium (Te)	$mg\ L^{-1}$	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	$mg\ L^{-1}$	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	$mg\ L^{-1}$	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	$mg\ L^{-1}$	---	0.005	0.007	<0.005	<0.005
Uranium (U)	$mg\ L^{-1}$	0.01	0.0001	0.0012	0.0012	0.0010
Vanadium (V)	$mg\ L^{-1}$	0.1	0.0002	0.0016	0.0017	0.0017
Zinc (Zn)	$mg\ L^{-1}$	1.0-5.0	0.004	0.007	<0.004	0.004

Appendix Table 5.10 (continued). 2009 Water Quality Analyses – Brightwater Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	—	0.025	0.266	0.349	0.224
2,4-DB	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	**0.030**	**0.067**
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	**0.112**	**0.200**
Mecoprop	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	—	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	—	0.025	<0.025	<0.025	<0.025

Appendix Table 5.11. 2009 Water Quality Analyses – Blackstrap Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	—	0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	—	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	—	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	—	0.2	0.9	0.8	0.8
Total P	mg L^{-1}	—	0.2	<0.2	<0.2	<0.2
Orthophosphate (PO_4-P)	mg L^{-1}	—	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	—	1	55	53	50
Magnesium (Mg)	mg L^{-1}	—	0.1	40.3	41.0	39.7
Sodium (Na)	mg L^{-1}	—	1	66	66	66
Potassium (K)	mg L^{-1}	—	0.1	8.5	8.3	8.6
Chloride (Cl)	mg L^{-1}	100-700[6]	1	17	18	17
Sulfate (SO_4)	mg L^{-1}	—	4	248	247	238
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	—	5	186	171	166
Bicarbonate (HCO_3)	mg L^{-1}	—	5	226	208	202
Hydroxide (OH)	mg L^{-1}	—	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	—	5	<5	<5	<5
pH	pH	—	0.1	8.4	8.7	8.3
Electrical Conductivity	uS cm^{-1}	—	10	874	853	816
Temperature (at sampling)	^{0}C	—	0.1	18.1	19.5	19.6
Turbidity Rating (1-5)[1]	—	—	—	1	2	1
Total Suspended Solids	mg L^{-1}	–	10	<10	<10	<10
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	—	546	535	519
Hardness (as $CaCO_3$)[3]	mg L^{-1}	—	—	302	301	287
SAR[4]	—	—	—	1.7	1.7	1.7
Bacteria						
Total Coliforms	MPN/100mL	1000	3	430	4	430
Fecal Coliforms	MPN/100mL	100	3	230	<3	7

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.11 (continued). 2009 Water Quality Analyses – Blackstrap Reservoir sampling site

Parameter	Units	Irrigation Guideline^5	D.L.^{7}	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	<0.02	<0.02	<0.02
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0006	0.0006	0.0007
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0019	0.0023	0.0024
Barium (Ba)	mg L^{-1}	---	0.0002	0.0865	0.0755	0.0840
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0^6	0.02	0.09	0.10	0.09
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	<0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0^6	0.001	0.001	0.002	0.001
Iron (Fe)	mg L^{-1}	5.0	0.005	0.073	0.036	0.028
Lead (Pb)	mg L^{-1}	0.2	0.0001	<0.0001	<0.0001	0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.049	0.047	0.052
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.012	0.018	0.009
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0026	0.0026	0.0025
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0022	0.0024	0.0018
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0007	0.0004	<0.0004
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.435	0.386	0.409
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0017	0.0017	0.0017
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0011	0.0012	0.0013
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	<0.004	<0.004	<0.004

Appendix Table 5.11 (continued). 2009 Water Quality Analyses – Blackstrap Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]			
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.039	0.027	0.035
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 5.12. 2009 Water Quality Analyses – Bradwell Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	0.12
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	1.0	0.9	1.7
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	<0.02	<0.02	<0.02
Calcium (Ca)	mg L^{-1}	---	1	60	53	43
Magnesium (Mg)	mg L^{-1}	---	0.1	46.4	46.6	45.8
Sodium (Na)	mg L^{-1}	---	1	73	72	75
Potassium (K)	mg L^{-1}	---	0.1	11.0	10.5	10.8
Chloride (Cl)	mg L^{-1}	100-700[6]	1	19	20	19
Sulfate (SO_4)	mg L^{-1}	---	4	283	281	278
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	194	182	156
Bicarbonate (HCO_3)	mg L^{-1}	---	5	237	162	84
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	29	52
pH	pH	---	0.1	8.6	8.9	8.8
Electrical Conductivity	uS cm^{-1}	---	10	964	923	887
Temperature (at sampling)	^{0}C	---	0.1	17.9	20.0	22.0
Turbidity Rating (1-5)[1]	---	---	---	3	2	2
Total Suspended Solids	mg L^{-1}	--	10	<10	<10	13
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	608	592	565
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	340	324	295
SAR[4]	---	---	---	1.7	1.7	1.9
Bacteria						
Total Coliforms	MPN/100mL	1000	3	43	15	**1500**
Fecal Coliforms	MPN/100mL	100	3	<3	<3	**430**

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^+ (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.12 (continued). 2009 Water Quality Analyses – Bradwell Reservoir sampling site

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	0.06	<0.02	0.03
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0005	0.0005	0.0005
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0018	0.0024	0.0029
Barium (Ba)	mg L^{-1}	---	0.0002	0.0958	0.0576	0.0547
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.10	0.10	0.10
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	<0.0008	<0.0008	<0.0008
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0002	<0.0002	<0.0002
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.001	0.002	0.002
Iron (Fe)	mg L^{-1}	5.0	0.005	0.168	0.048	0.092
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0001	<0.0001	0.0001
Lithium (Li)	mg L^{-1}	2.5	0.006	0.057	0.056	0.058
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.025	0.015	0.025
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0025	0.0023	0.0022
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0021	0.0021	0.0017
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0006	<0.0004	0.0004
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.500	0.430	0.416
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	<0.005	<0.005	<0.005
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0015	0.0014	0.0013
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0011	0.0010	0.0013
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.004	0.005	0.004

Appendix Table 5.12 (continued). 2009 Water Quality Analyses – Bradwell Reservoir sampling site

Parameter	**Units**	**Irrigation Guideline[5]**	**D.L.[7]**	**June 23**	**July 21**	**August 11**
				Grab Sample	**Grab Sample**	**Grab Sample**
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.061	0.047	<0.025
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	**0.027**	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 5.13. 2009 Water Quality Analyses – Lumsden-1 sampling site (upstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	<0.5	<0.5	<0.5
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	<0.05	<0.05	<0.05
Total Kjeldahl N	mg L^{-1}	---	0.2	1.1	0.6	0.7
Total P	mg L^{-1}	---	0.2	<0.2	<0.2	0.2
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	0.02	0.03	<0.02
Calcium (Ca)	mg L^{-1}	---	1	33	26	30
Magnesium (Mg)	mg L^{-1}	---	0.1	20.5	18.2	19.2
Sodium (Na)	mg L^{-1}	---	1	44	36	37
Potassium (K)	mg L^{-1}	---	0.1	4.7	3.9	4.8
Chloride (Cl)	mg L^{-1}	100-700[6]	1	15	13	13
Sulfate (SO_4)	mg L^{-1}	---	4	100	91	86
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	134	120	134
Bicarbonate (HCO_3)	mg L^{-1}	---	5	163	147	163
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5
pH	pH	---	0.1	8.3	8.8	8.4
Electrical Conductivity	uS cm^{-1}	---	10	508	442	465
Temperature (at sampling)	^{0}C	---	0.1	20.0	22.0	20.0
Turbidity Rating (1-5)[1]	---	---	---	4	4	3
Total Suspended Solids	mg L^{-1}	–	10	55	41	49
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	297	260	271
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	166	139	154
SAR[4]	---	---	---	1.5	1.3	1.3
Bacteria						
Total Coliforms	MPN/100mL	1000	3	230	93	93
Fecal Coliforms	MPN/100mL	100	3	9	93	43

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = Na+Ca+Mg+K+SO_4+Cl+(Total Alkalinity*0.600)+(NO_3-N*4.427)

[3] Hardness (as $CaCO_3$) = Ca (mg L^{-1})*2.5 + Mg (mg L^{-1})*4.12

[4] Sodium Adsorption Ratio = Na^{+} (meq L^{-1})/[[Ca^{++} (meq L^{-1}) + Mg^{++} (meq L^{-1})]/2]$^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.13 (continued). 2009 Water Quality Analyses – Lumsden-1 sampling site (upstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline^5	D.L.^{7}	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	1.02	0.60	0.92
Antimony (Sb)	mg L^{-1}	---	0.0004	0.0005	0.0006	0.0005
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0030	0.0028	0.0028
Barium (Ba)	mg L^{-1}	---	0.0002	0.0738	0.0541	0.0674
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0^6	0.02	0.06	0.05	0.05
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0023	0.0012	0.0015
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0008	0.0006	0.0006
Copper (Cu)	mg L^{-1}	0.2-1.0^6	0.001	0.004	0.003	0.003
Iron (Fe)	mg L^{-1}	5.0	0.005	1.510	1.020	1.13
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0012	0.0008	0.0009
Lithium (Li)	mg L^{-1}	2.5	0.006	0.022	0.017	0.019
Manganese (Mn)	mg L^{-1}	0.2	0.001	0.081	0.069	0.056
Mercury (Hg)	mg L^{-1}	---	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0019	0.0017	0.0016
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0038	0.0032	0.0027
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0007	0.0005	0.0005
Sliver (Ag)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	---	0.0002	0.244	0.191	0.231
Tellurium (Te)	mg L^{-1}	---	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	---	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	---	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	---	0.005	0.026	0.016	0.022
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0016	0.0016	0.0016
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0047	0.0050	0.0038
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.017	0.009	0.007

Appendix Table 5.13 (continued). 2009 Water Quality Analyses – Lumsden-1 sampling site (upstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	**Grab Sample**	**Grab Sample**
Herbicides						
2,4-D	ug L^{-1}	---	0.025	0.124	0.093	0.072
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	<0.025	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	<0.025	<0.025	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	<0.025	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix Table 5.14. 2009 Water Quality Analyses – Lumsden-2 sampling site (downstream from the Wascana Creek inlet to the Qu'Appelle River)

Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Nutrients & Chemical						
Ammonia-N	mg L^{-1}	---	0.05	2.02	<0.05	0.63
Nitrate-N (NO_3-N)	mg L^{-1}	---	0.5	2.0	4.4	4.1
Nitrite-N (NO_2-N)	mg L^{-1}	---	0.05	0.28	0.06	0.35
Total Kjeldahl N	mg L^{-1}	---	0.2	4.2	0.9	2.0
Total P	mg L^{-1}	---	0.2	<0.2	0.3	0.4
Orthophosphate (PO_4-P)	mg L^{-1}	---	0.02	0.17	0.15	0.13
Calcium (Ca)	mg L^{-1}	---	1	43	48	51
Magnesium (Mg)	mg L^{-1}	---	0.1	21.2	25.3	27.5
Sodium (Na)	mg L^{-1}	---	1	64	72	81
Potassium (K)	mg L^{-1}	---	0.1	8.9	7.8	9.9
Chloride (Cl)	mg L^{-1}	100-700[6]	1	52	61	60
Sulfate (SO_4)	mg L^{-1}	---	4	125	157	170
Alkalinity, Total (as $CaCO_3$)	mg L^{-1}	---	5	147	132	138
Bicarbonate (HCO_3)	mg L^{-1}	---	5	17	161	168
Hydroxide (OH)	mg L^{-1}	---	5	<5	<5	<5
Carbonate (CO_3)	mg L^{-1}	---	5	<5	<5	<5
pH	pH	---	0.1	7.9	8.2	8.3
Electrical Conductivity	uS cm^{-1}	---	10	722	790	845
Temperature (at sampling)	^{0}C	---	0.1	19.0	21.0	20.0
Turbidity Rating (1-5)[1]	---	---	---	4	4	3
Total Suspended Solids	mg L^{-1}	--	10	119	77	40
TDS (calculated)[2]	mg L^{-1}	500-3500[6]	---	413	469	501
Hardness (as $CaCO_3$)[3]	mg L^{-1}	---	---	194	223	240
SAR[4]	---	---	---	2.0	2.1	2.3
Bacteria						
Total Coliforms	MPN/100mL	1000	3	**23000**	230	230
Fecal Coliforms	MPN/100mL	100	3	**430**	23	**230**

[1] 1=Clear; can read a newspaper under water; 2=Low turbidity; can see bottom of stream but not clearly; 3=Moderately turbid; cannot see bottom of stream; 4=Highly turbid; can only see part of bottle under water; 5=Very turbid; cannot see beyond surface of water.

[2] Total Dissolved Solids = $Na+Ca+Mg+K+SO_4+Cl+(\text{Total Alkalinity}*0.600)+(NO_3\text{-}N*4.427)$

[3] Hardness (as $CaCO_3$) = $Ca\ (mg\ L^{-1})*2.5 + Mg\ (mg\ L^{-1})*4.12$

[4] Sodium Adsorption Ratio = $Na^{+}\ (meq\ L^{-1})/[[Ca^{++}\ (meq\ L^{-1}) + Mg^{++}\ (meq\ L^{-1})]/2]^{1/2}$

[5] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (updated 2005).

[6] Crop specific (refer to CCME guidelines)

[7] Detection limit

Appendix Table 5.14 (continued). 2009 Water Quality Analyses – Lumsden-2 sampling site (downstream from the Wascana Creek inlet to the Qu'Appelle River)

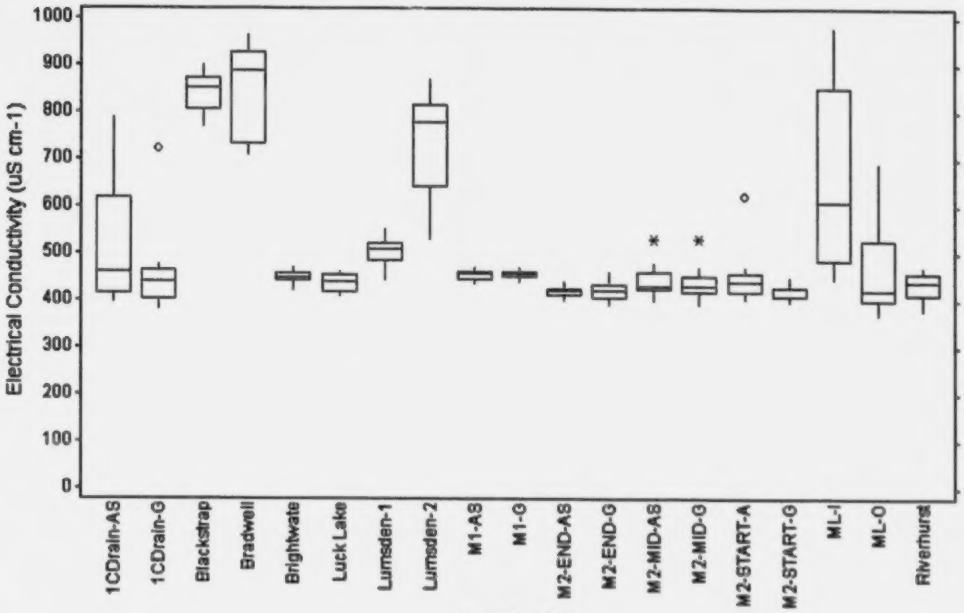
Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Metals						
Aluminum (Al)	mg L^{-1}	5.0	0.02	1.61	0.95	0.58
Antimony (Sb)	mg L^{-1}	—	0.0004	0.0009	0.0008	0.0008
Arsenic (As)	mg L^{-1}	0.1	0.0004	0.0045	0.0040	0.0038
Barium (Ba)	mg L^{-1}	—	0.0002	0.0789	0.0625	0.0618
Beryllium (Be)	mg L^{-1}	0.1	0.001	<0.001	<0.001	<0.001
Bismuth (Bi)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Boron (B)	mg L^{-1}	0.5-6.0[6]	0.02	0.12	0.12	0.14
Cadmium (Cd)	mg L^{-1}	0.005	0.0002	<0.0002	<0.0002	<0.0002
Chromium (Cr)	mg L^{-1}	0.005-0.008	0.0008	0.0041	0.0018	0.0020
Cobalt (Co)	mg L^{-1}	0.05	0.0002	0.0017	0.0013	0.0008
Copper (Cu)	mg L^{-1}	0.2-1.0[6]	0.001	0.006	0.005	0.003
Iron (Fe)	mg L^{-1}	5.0	0.005	2.620	1.820	0.740
Lead (Pb)	mg L^{-1}	0.2	0.0001	0.0020	0.0014	0.0007
Lithium (Li)	mg L^{-1}	2.5	0.006	0.034	0.031	0.037
Manganese (Mn)	mg L^{-1}	0.2	0.001	**0.240**	0.103	0.053
Mercury (Hg)	mg L^{-1}	—	0.00010	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg L^{-1}	0.01-0.05	0.0001	0.0095	0.0105	0.0091
Nickel (Ni)	mg L^{-1}	0.2	0.0002	0.0079	0.0065	0.0046
Selenium (Se)	mg L^{-1}	0.02-0.05	0.0004	0.0029	0.0014	<0.0004
Sliver (Ag)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Strontium (Sr)	mg L^{-1}	—	0.0002	0.256	0.265	0.305
Tellurium (Te)	mg L^{-1}	—	0.0006	<0.0006	<0.0006	<0.0006
Thallium (Tl)	mg L^{-1}	—	0.0001	<0.0001	<0.0001	<0.0001
Tin (Sn)	mg L^{-1}	—	0.0004	<0.0004	<0.0004	<0.0004
Titanium (Ti)	mg L^{-1}	—	0.005	0.039	0.027	0.015
Uranium (U)	mg L^{-1}	0.01	0.0001	0.0017	0.0017	0.0015
Vanadium (V)	mg L^{-1}	0.1	0.0002	0.0398	0.0224	0.0163
Zinc (Zn)	mg L^{-1}	1.0-5.0	0.004	0.021	0.013	0.009

Appendix Table 5.14 (continued). 2009 Water Quality Analyses – Lumsden-2 sampling site (downstream from the Wascana Creek inlet to the Qu'Appelle River)

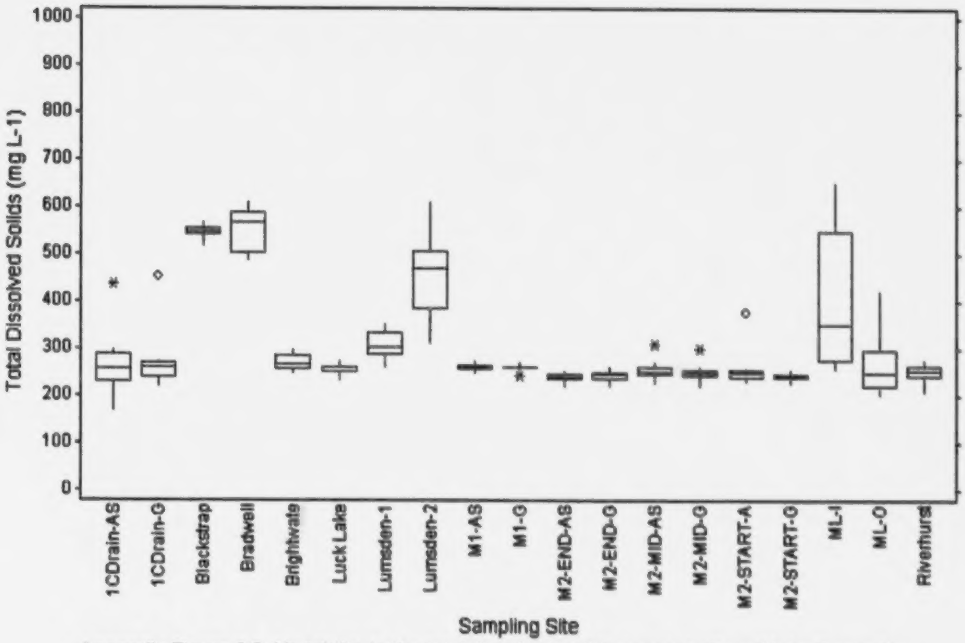
Parameter	Units	Irrigation Guideline[5]	D.L.[7]	June 23	July 21	August 11
				Grab Sample	Grab Sample	Grab Sample
Herbicides						
2,4-D	ug L^{-1}	---	0.025	1.488	0.295	0.171
2,4-DB	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Atrazine	ug L^{-1}	10	0.025	<0.025	<0.025	<0.025
Bromacil	ug L^{-1}	0.2	0.025	<0.025	<0.025	<0.025
Bromoxynil	ug L^{-1}	0.33	0.025	0.093	<0.025	<0.025
Clopyralid	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dicamba	ug L^{-1}	0.006	0.025	**0.411**	**0.058**	<0.025
Diclofop-methyl	ug L^{-1}	0.18	0.025	<0.025	<0.025	<0.025
Dichlorprop	ug L^{-1}	---	0.025	0.143	<0.025	<0.025
Ethalfluralin	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Fenoxaprop	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Imazethapyr	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
MCPA	ug L^{-1}	0.025	0.025	**0.190**	<0.025	<0.025
Mecoprop	ug L^{-1}	---	0.025	0.475	0.101	<0.025
Picloram	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Quinclorac	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Trifluralin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Triallate	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Insecticides						
Aldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Chlorpyrifos	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"op" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
"pp" DDE	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dieldrin	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Dimethoate	ug L^{-1}	---	0.125	<0.125	<0.125	<0.125
Heptachlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Heptachlor-Epoxide	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Lindane	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025
Methoxychlor	ug L^{-1}	---	0.025	<0.025	<0.025	<0.025

Appendix 6

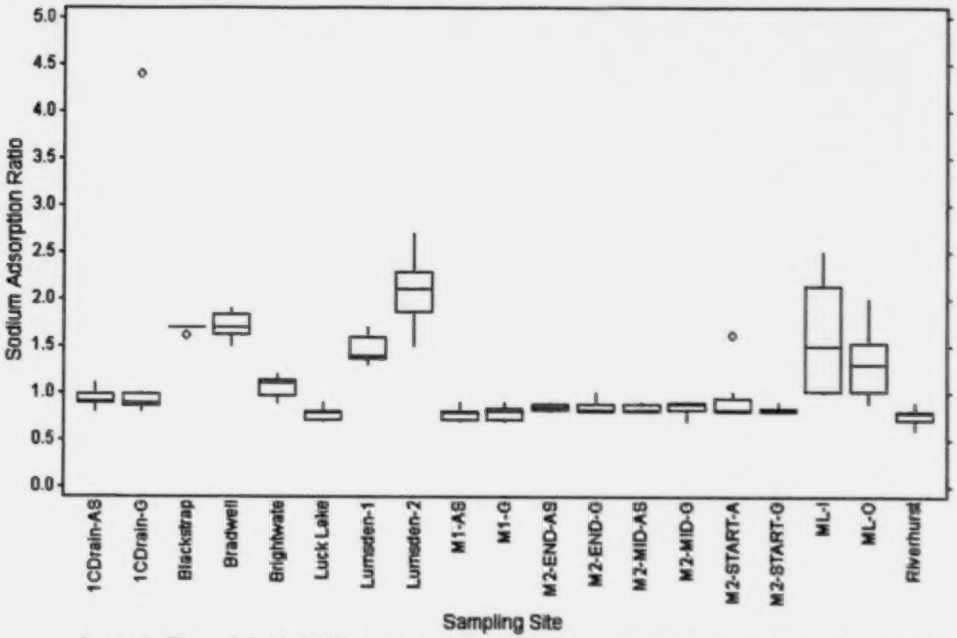
Box and Whisker Plots



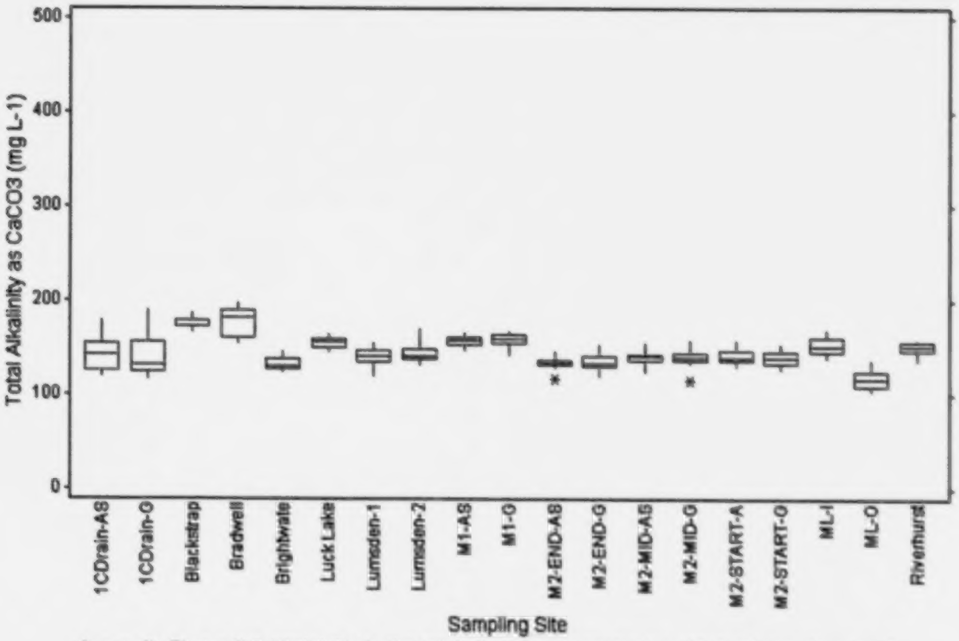
Appendix Figure 6.1. Variability in the electrical conductivity of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



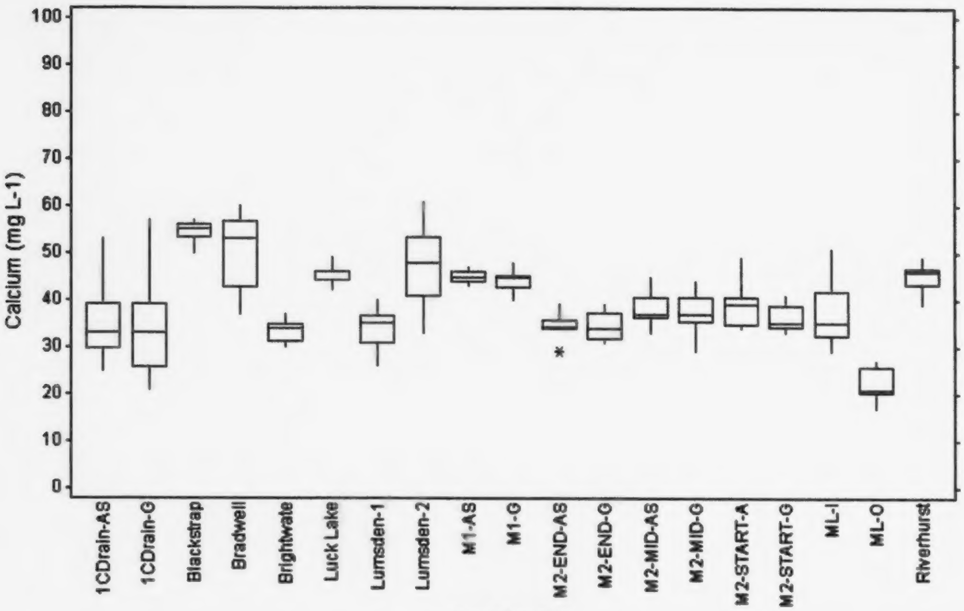
Appendix Figure 6.2. Variability in the total dissolved solids concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



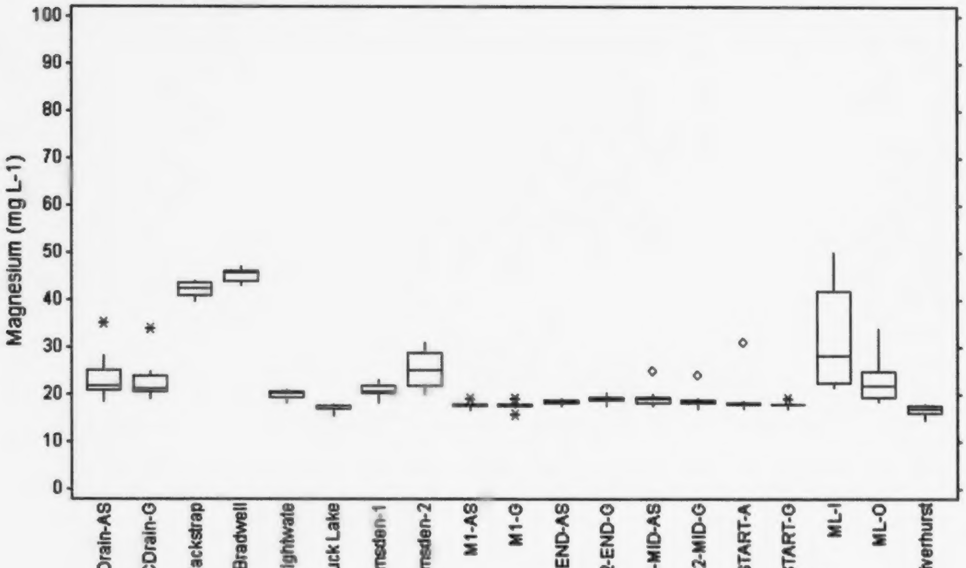
Appendix Figure 6.3. Variability in the sodium adsorption ratio of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; o – probable outlier data value).



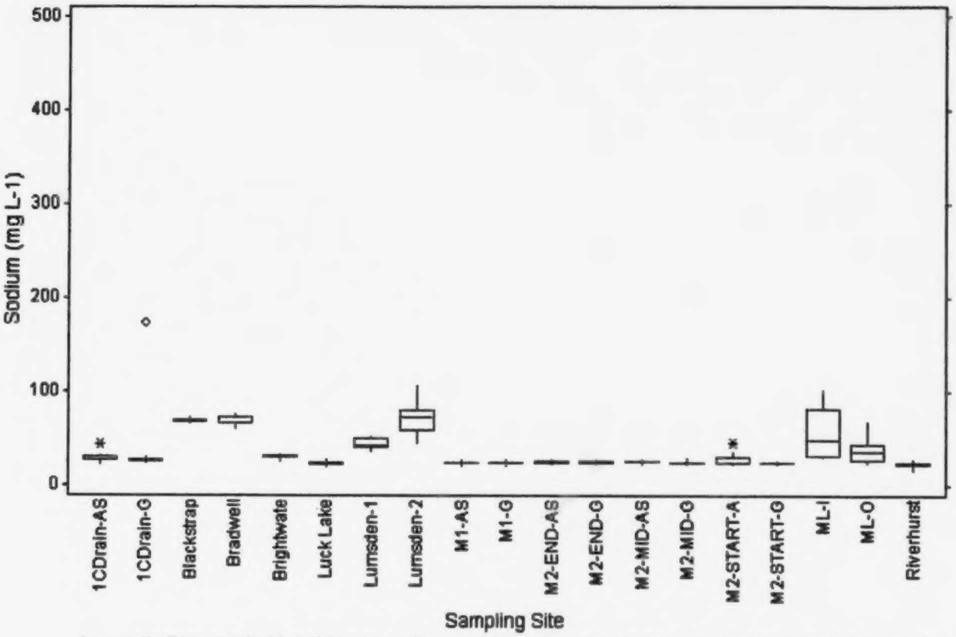
Appendix Figure 6.4. Variability in the total alkalinity concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value).



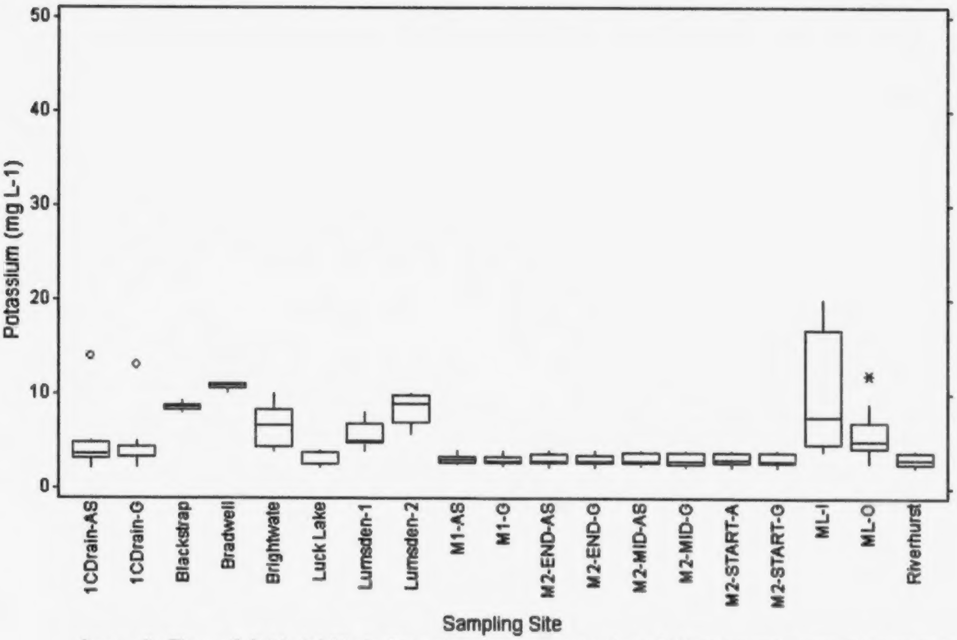
Appendix Figure 6.5. Variability in the calcium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value).



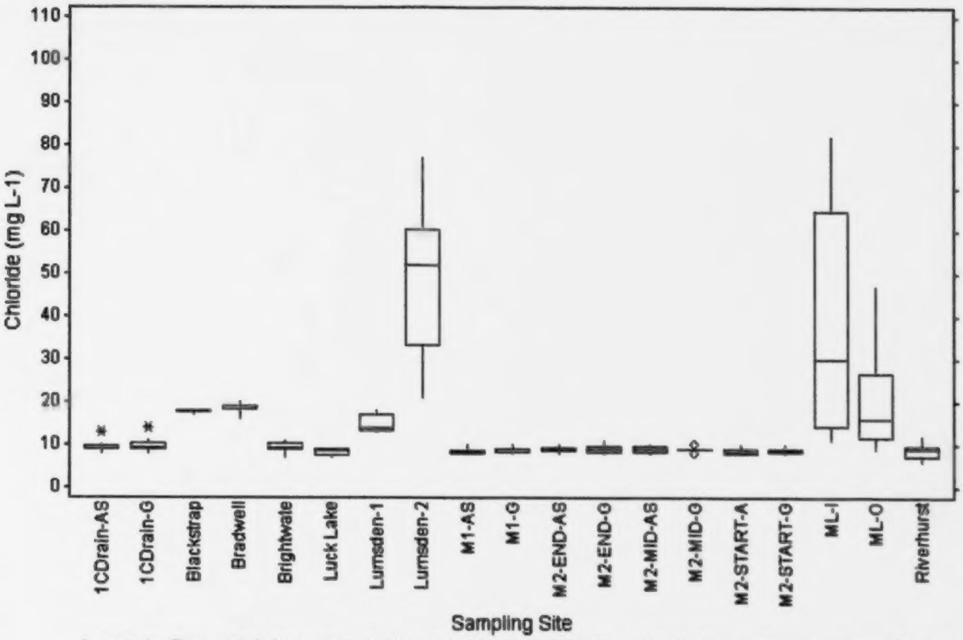
Appendix Figure 6.6. Variability in the magnesium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



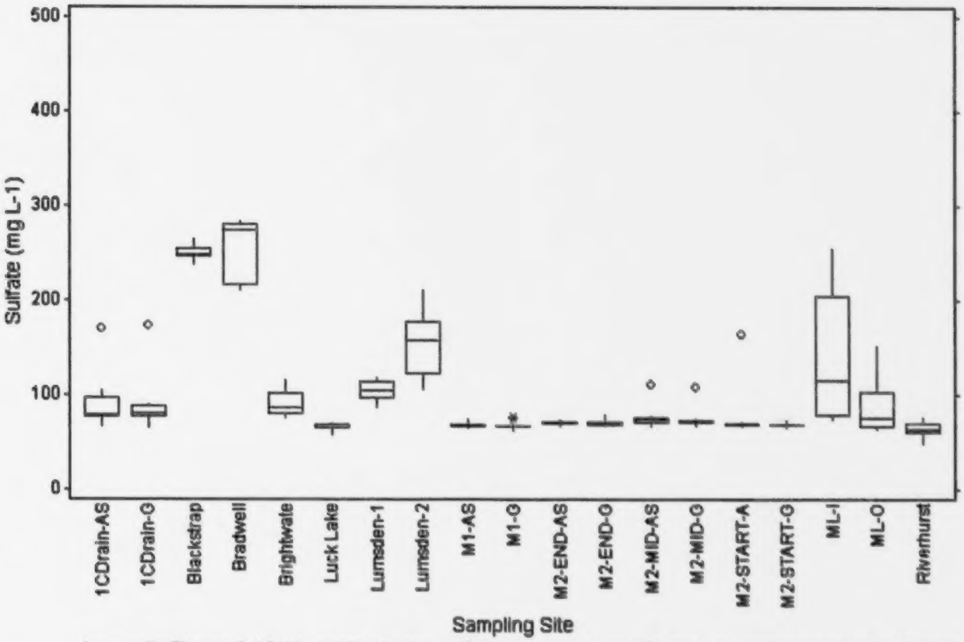
Appendix Figure 6.7. Variability in sodium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



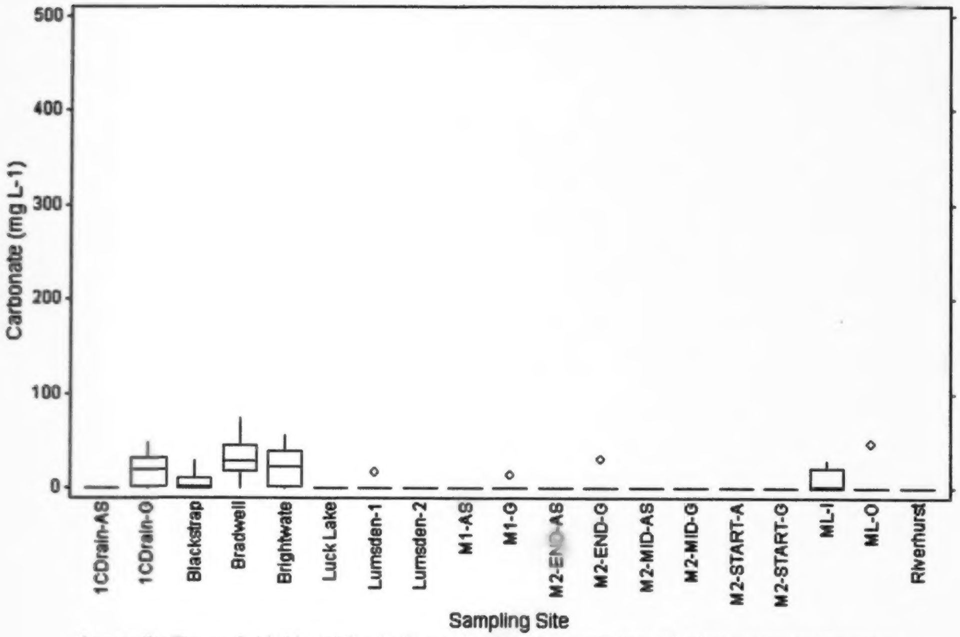
Appendix Figure 6.8. Variability in the potassium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



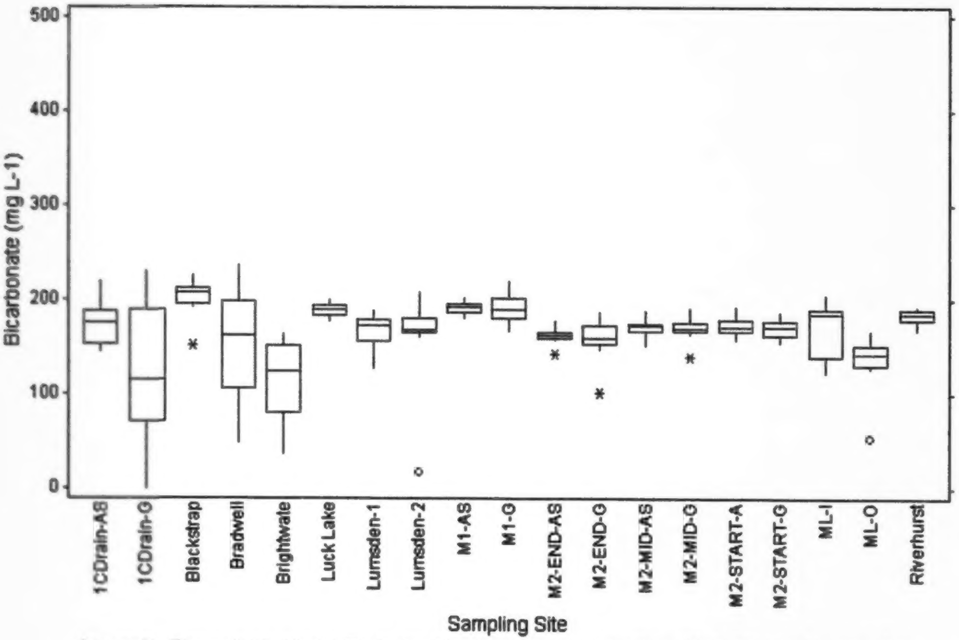
Appendix Figure 6.9. Variability in the chloride concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



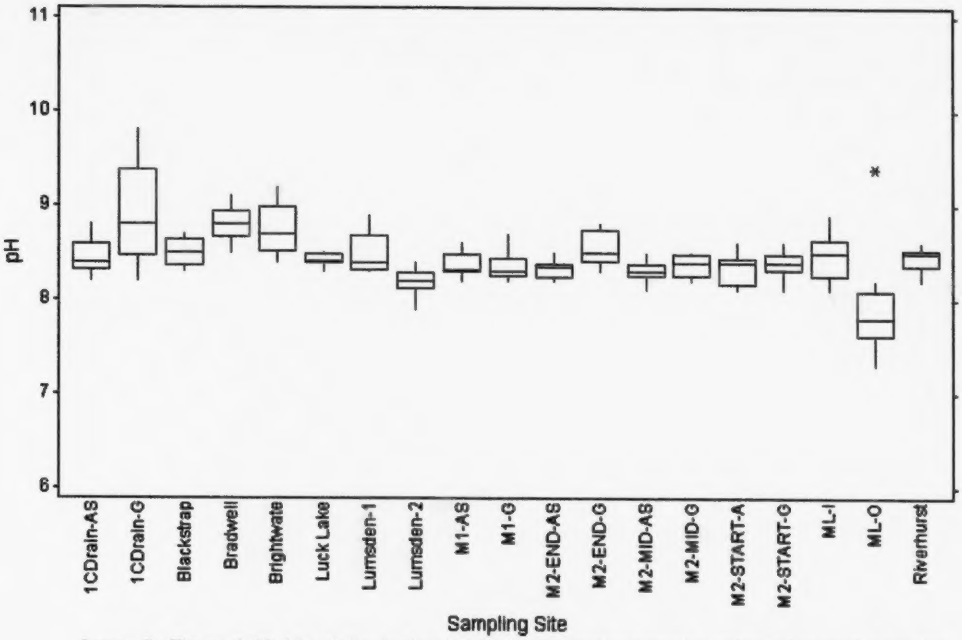
Appendix Figure 6.10. Variability in the sulfate concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



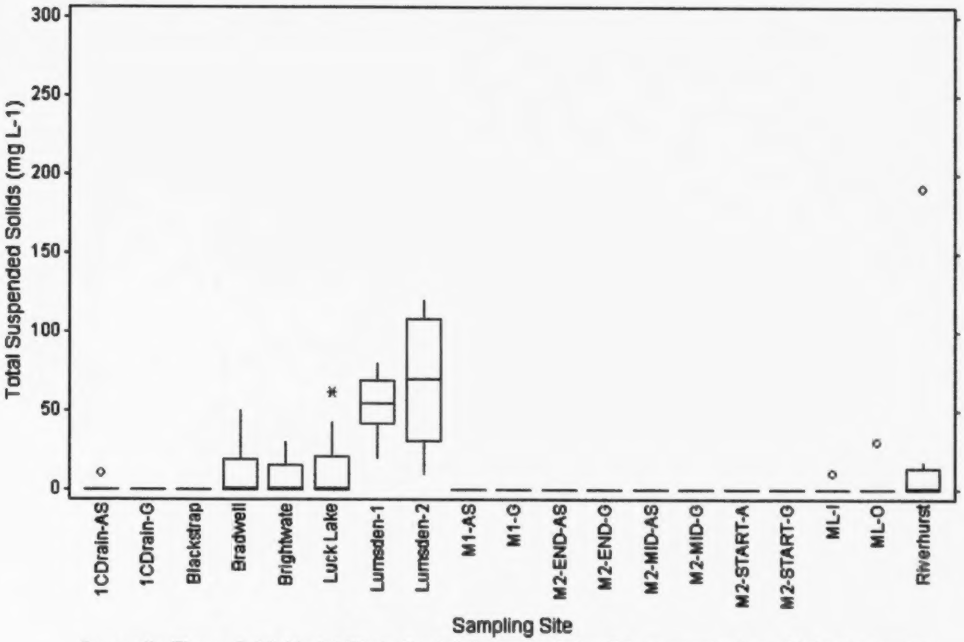
Appendix Figure 6.11. Variability in the carbonate concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; ○ – probable outlier data value).



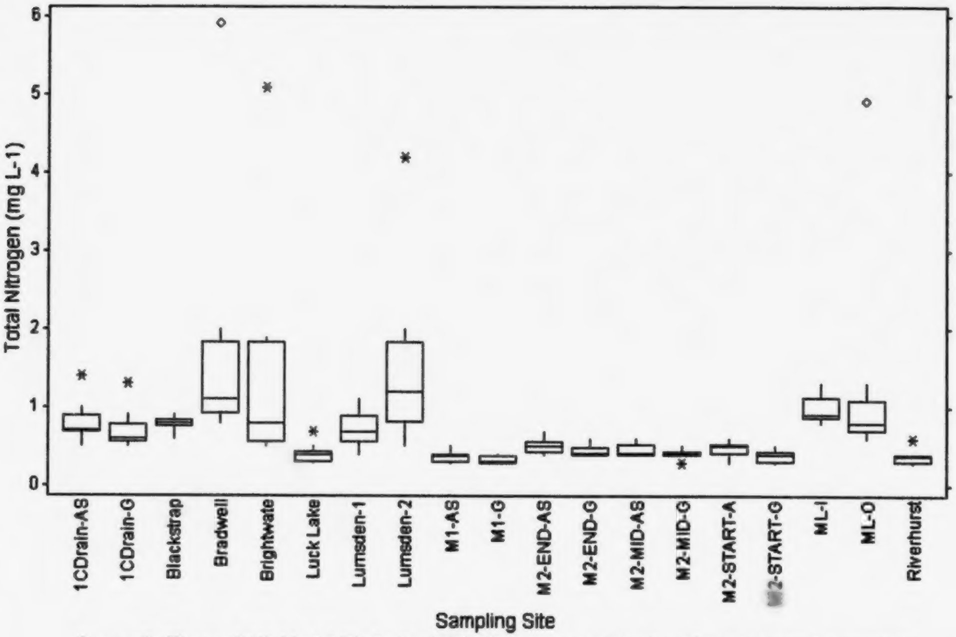
Appendix Figure 6.12. Variability in the bicarbonate concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



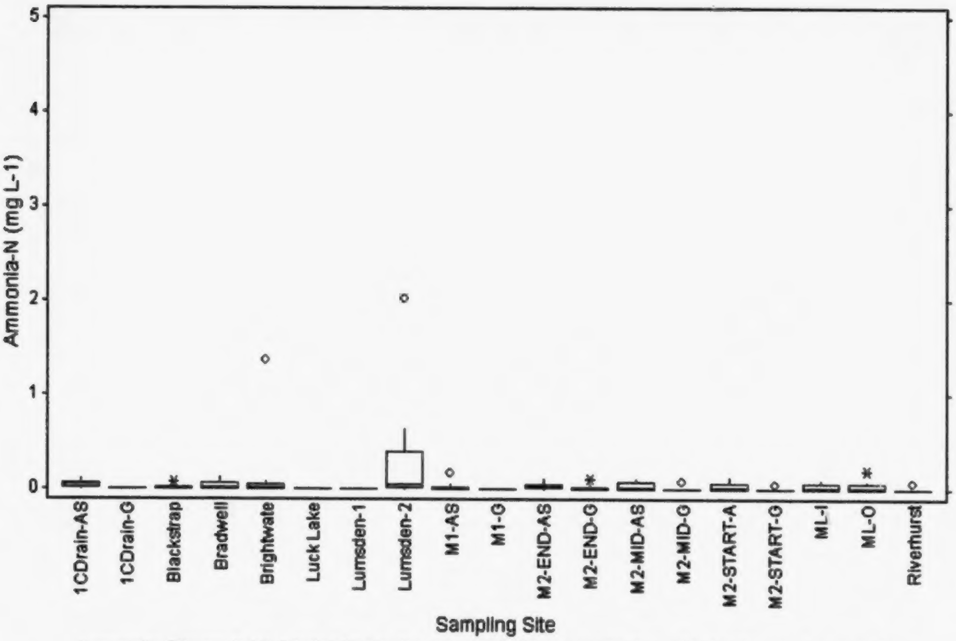
Appendix Figure 6.13. Variability in the pH of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value).



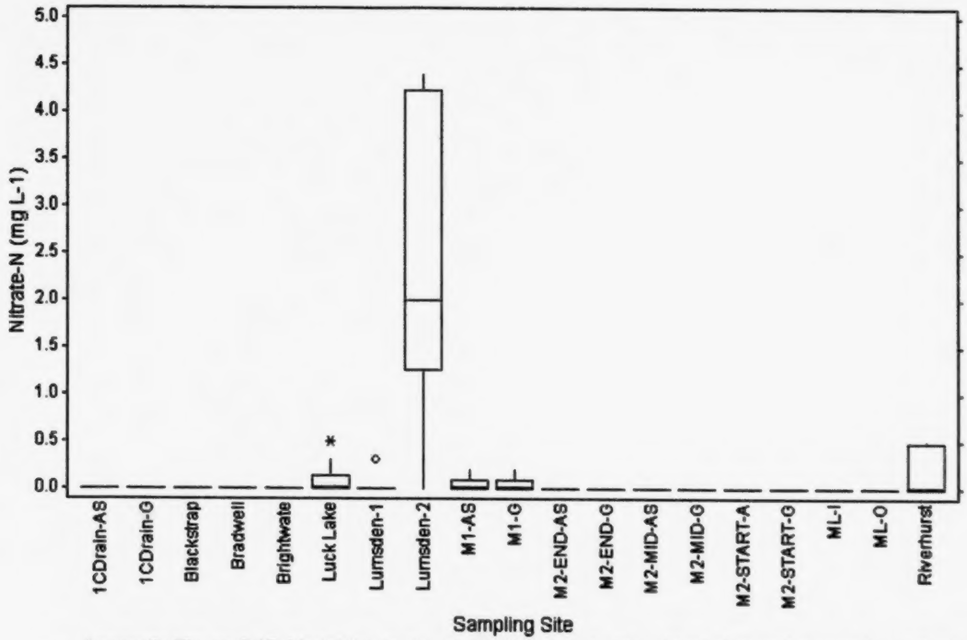
Appendix Figure 6.14. Variability in the total suspended solids concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



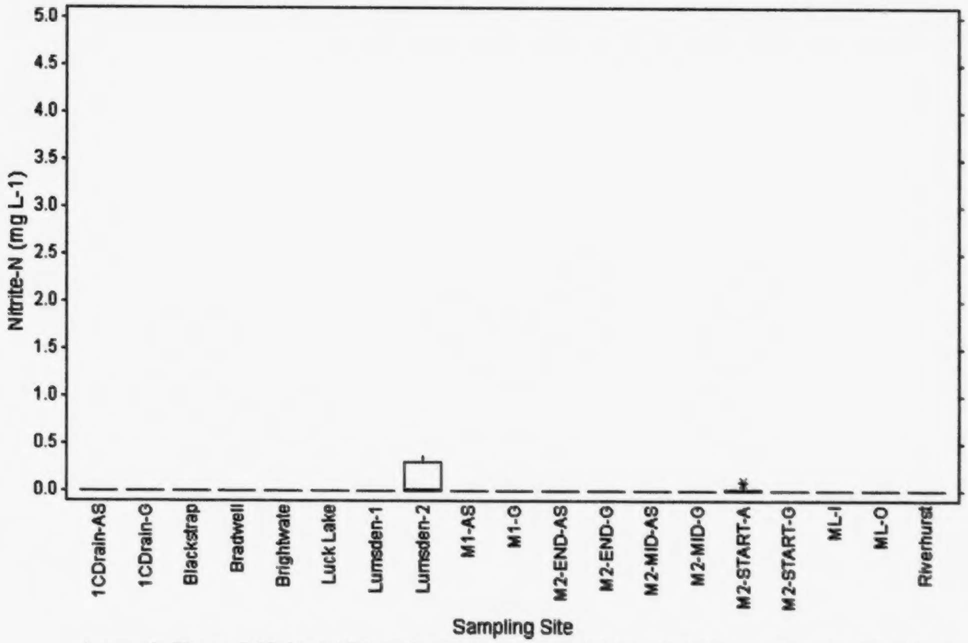
Appendix Figure 6.15. Variability in the total nitrogen concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



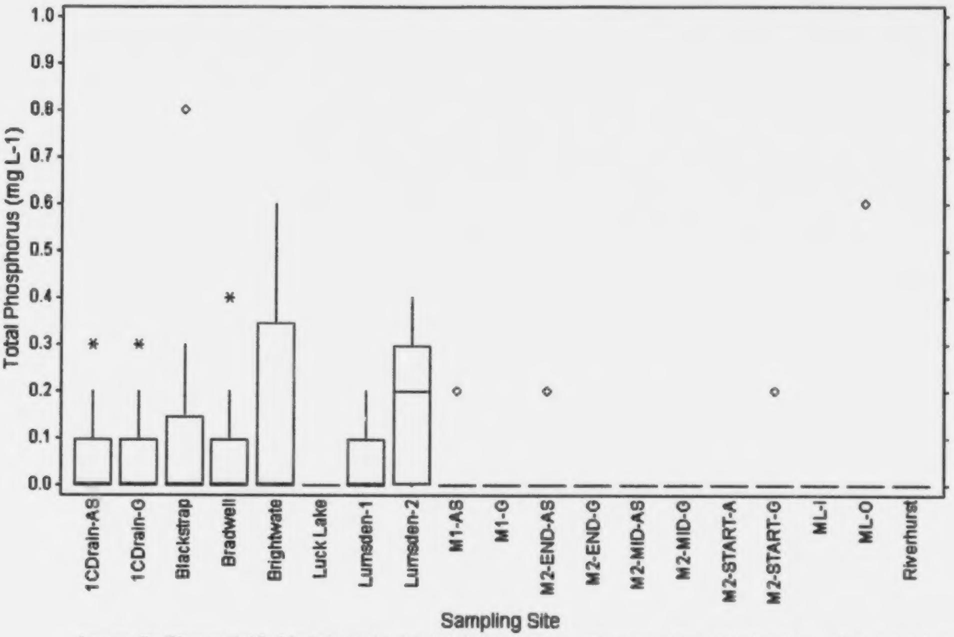
Appendix Figure 6.16. Variability in the ammonia-N concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



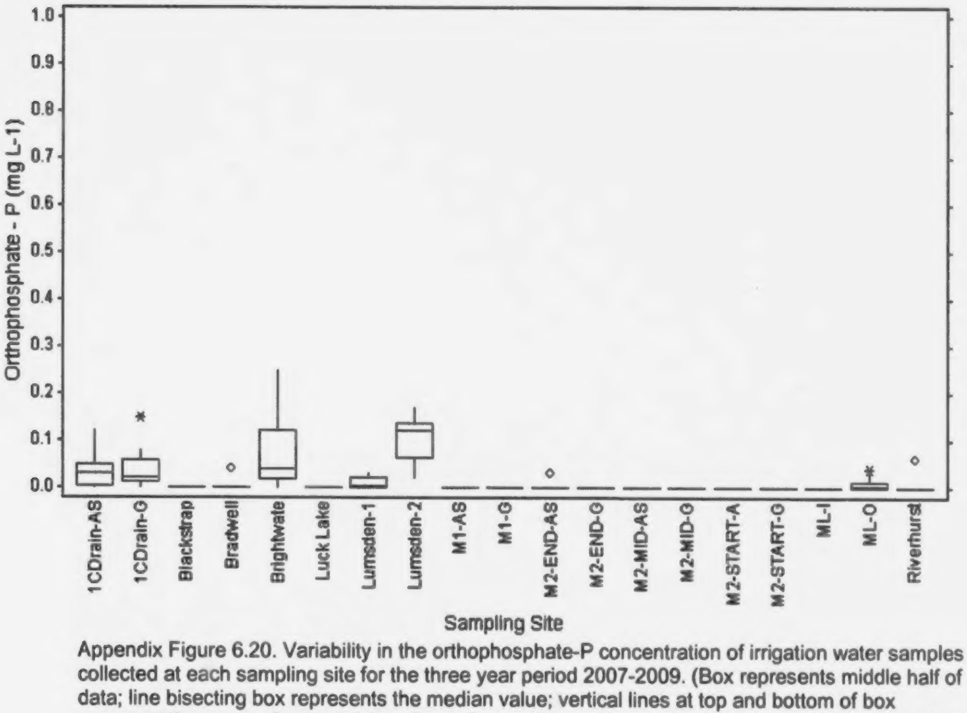
Appendix Figure 6.17. Variability in the nitrate-N concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



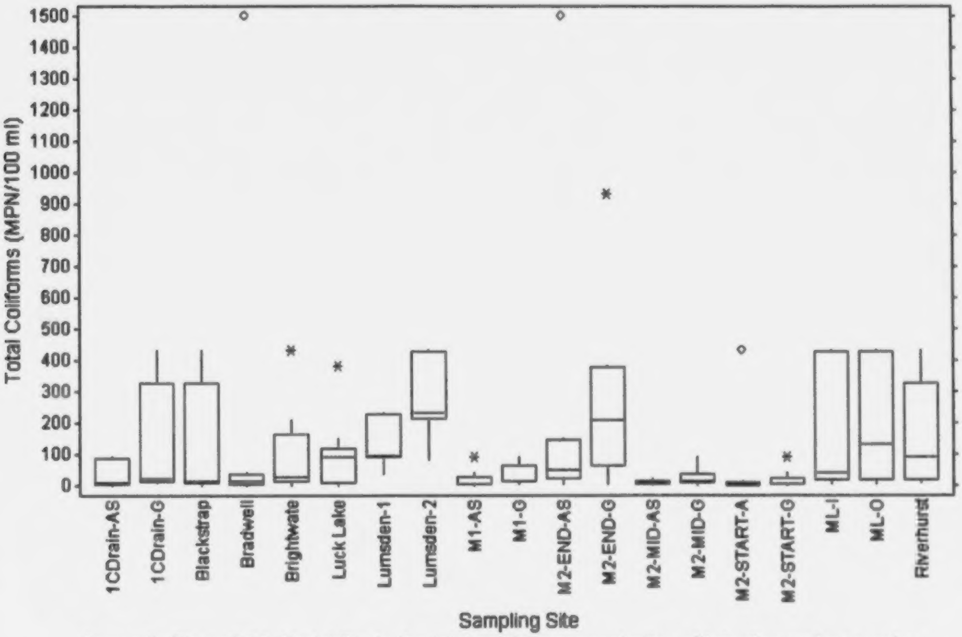
Appendix Figure 6.18. Variability in the nitrite-N concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value).



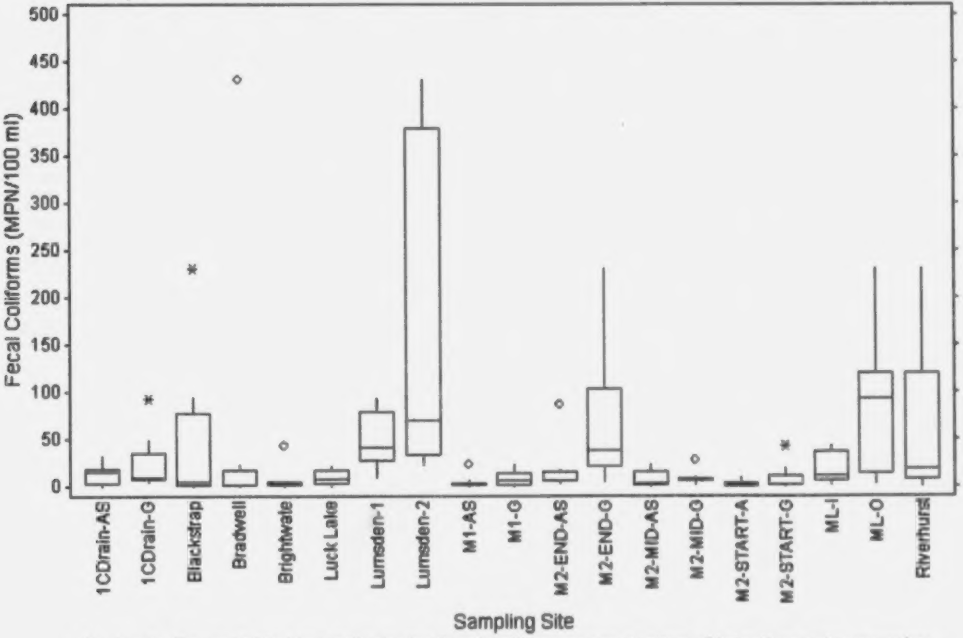
Appendix Figure 6.19. Variability in the total phosphorus concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



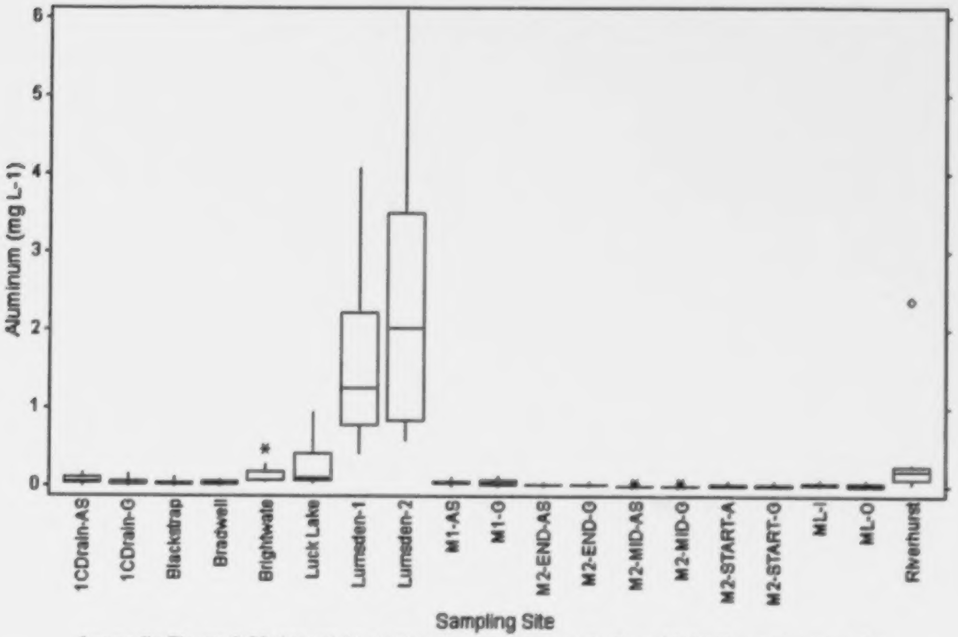
Appendix Figure 6.20. Variability in the orthophosphate-P concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



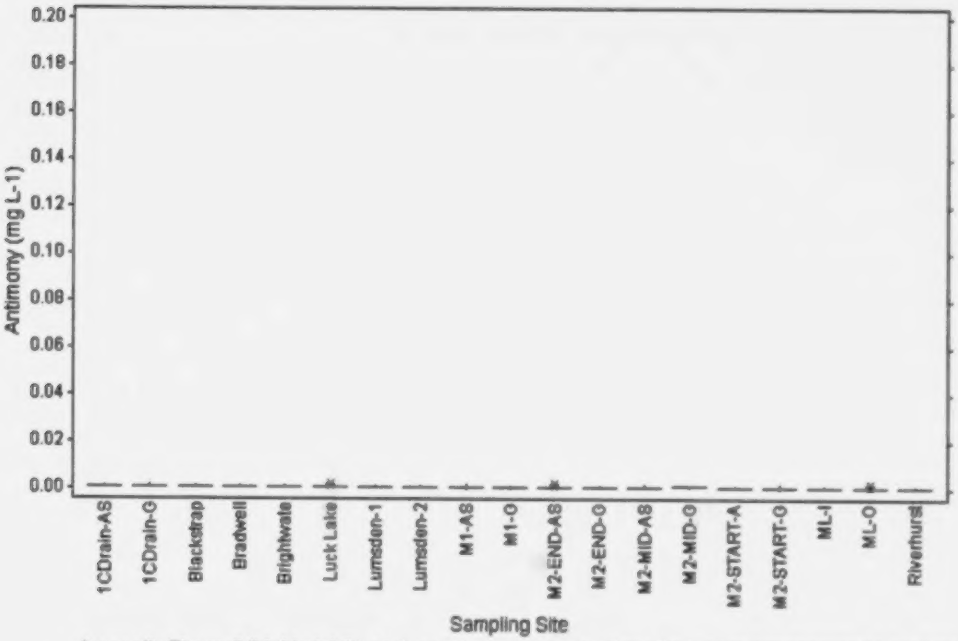
Appendix Figure6.21. Variability in the total coliform concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



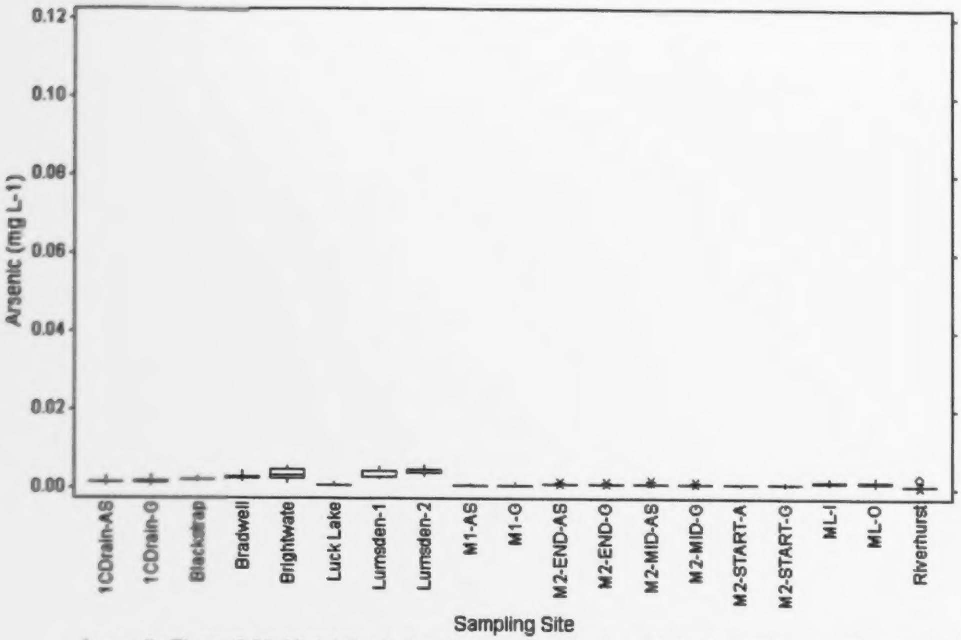
Appendix Figure 6.22. Variability in the fecal coliform concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



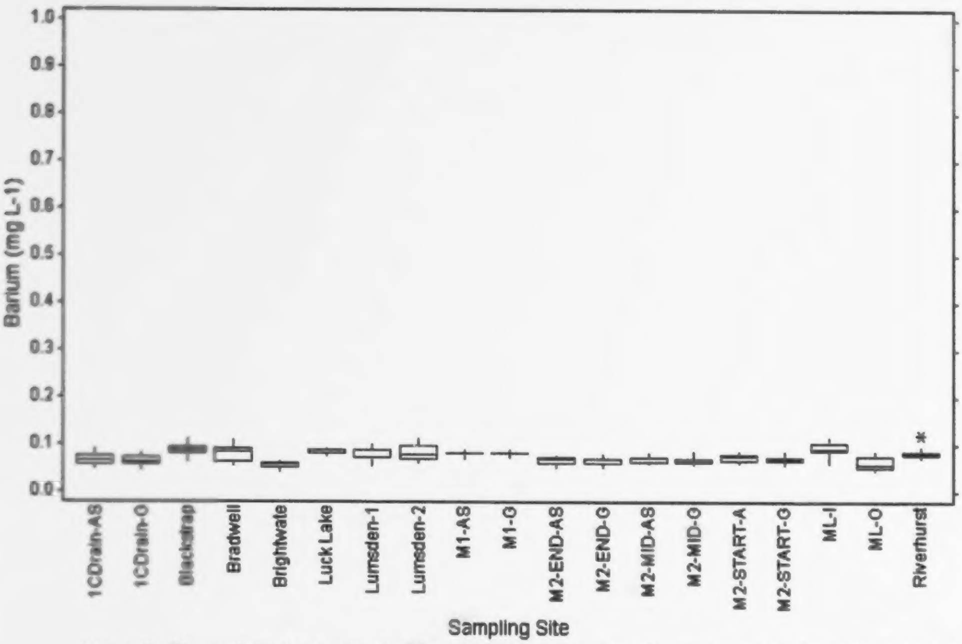
Appendix Figure 6.23. Variability in the aluminum concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; o – probable outlier data value).



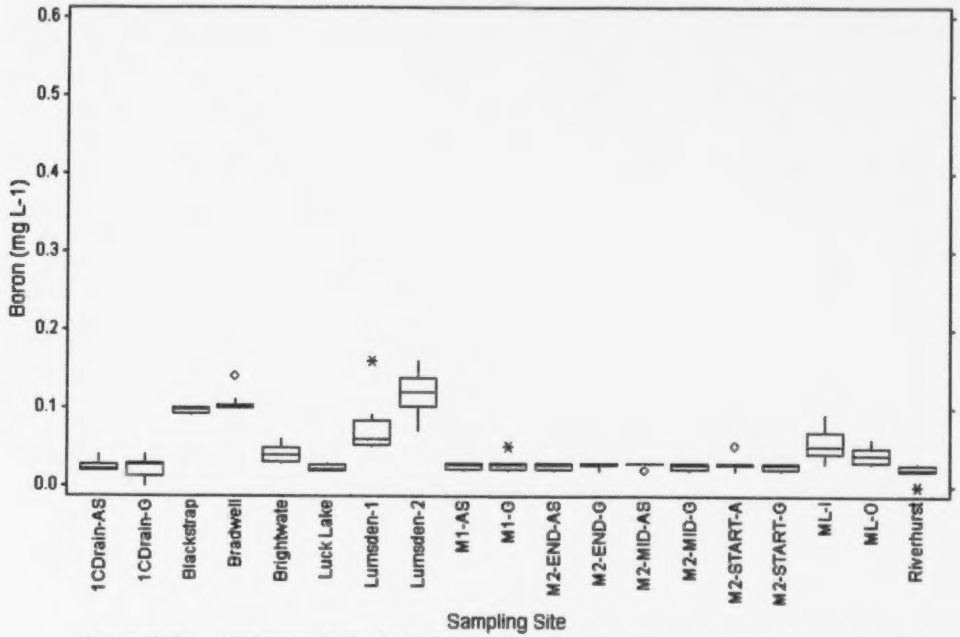
Appendix Figure 6.24. Variability in the antimony concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value).



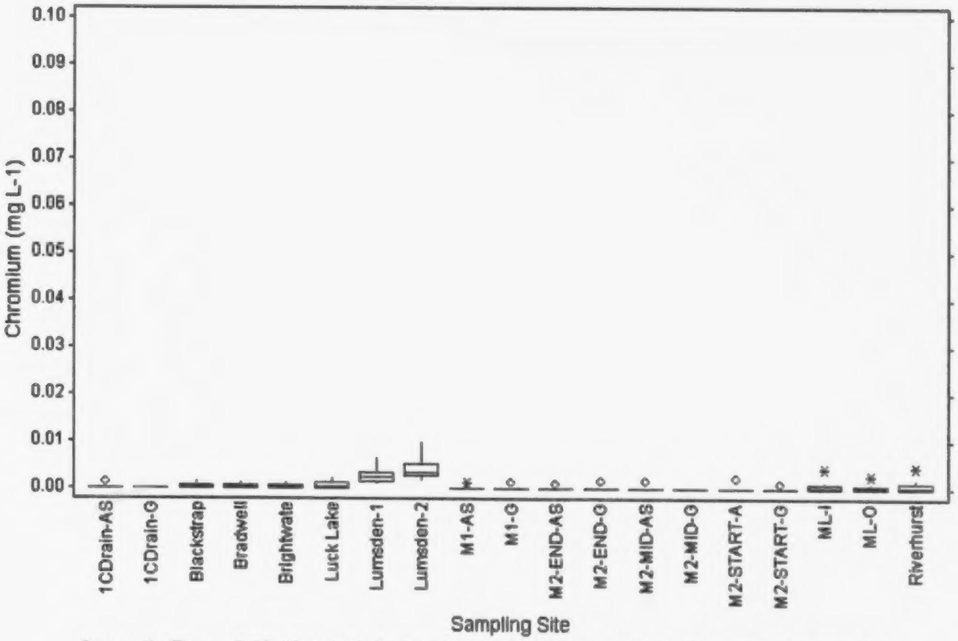
Appendix Figure 6.25. Variability in the arsenic concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; o – probable outlier data value).



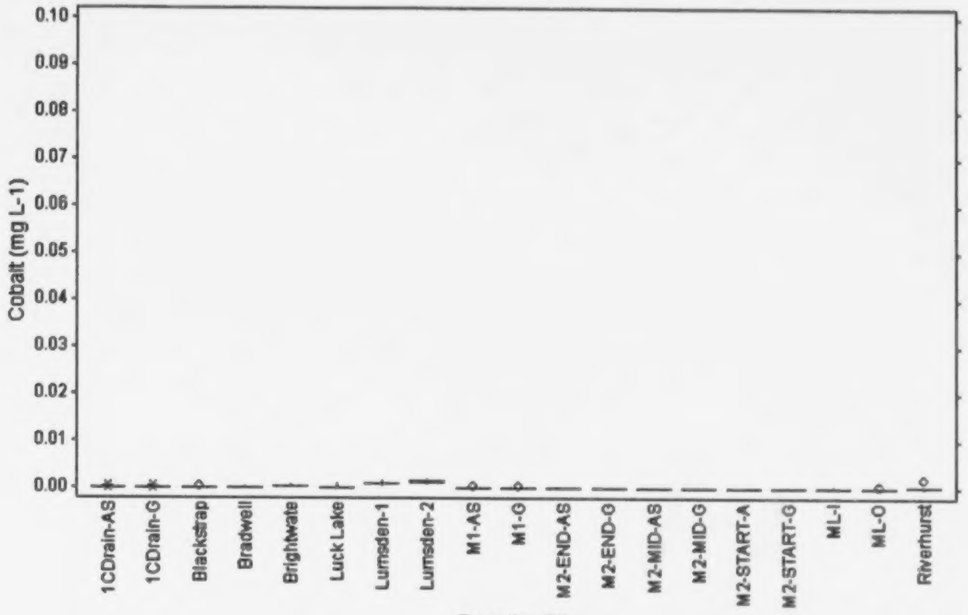
Appendix Figure 6.26. Variability in the barium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value).



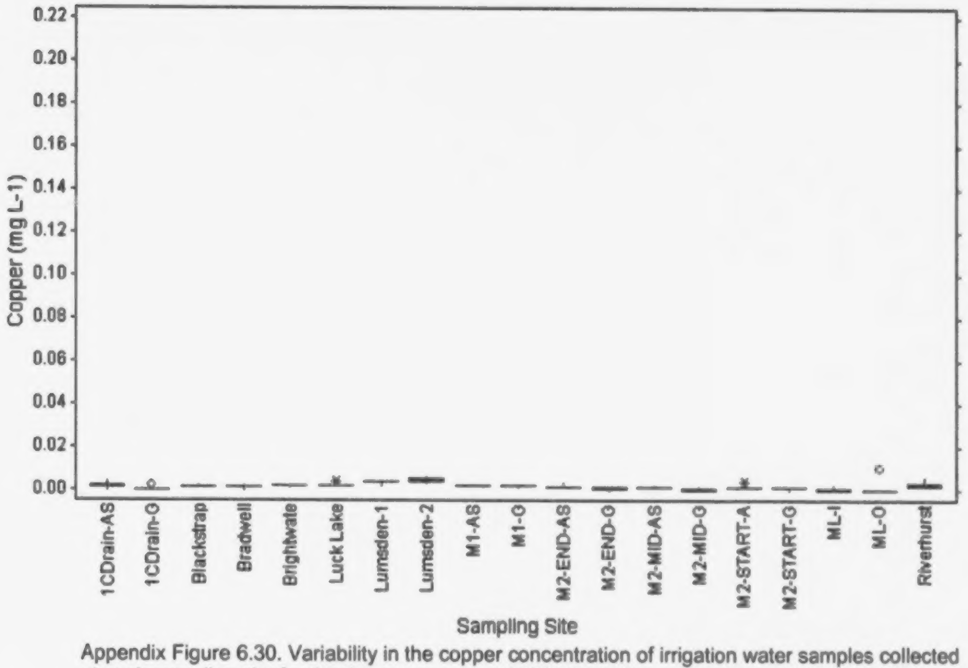
Appendix Figure 6.27. Variability in the boron concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



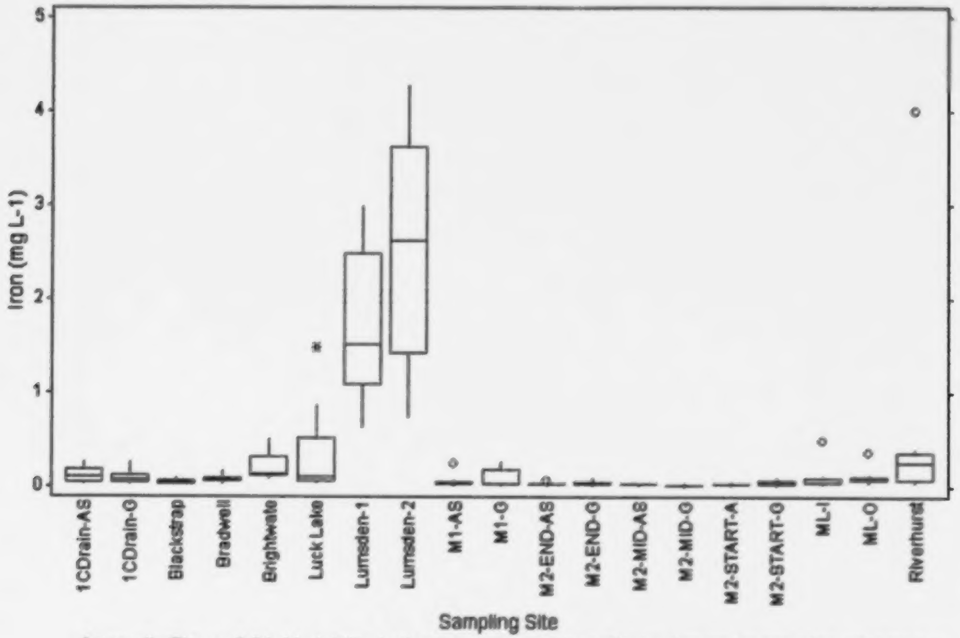
Appendix Figure 6.28. Variability in the chromium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



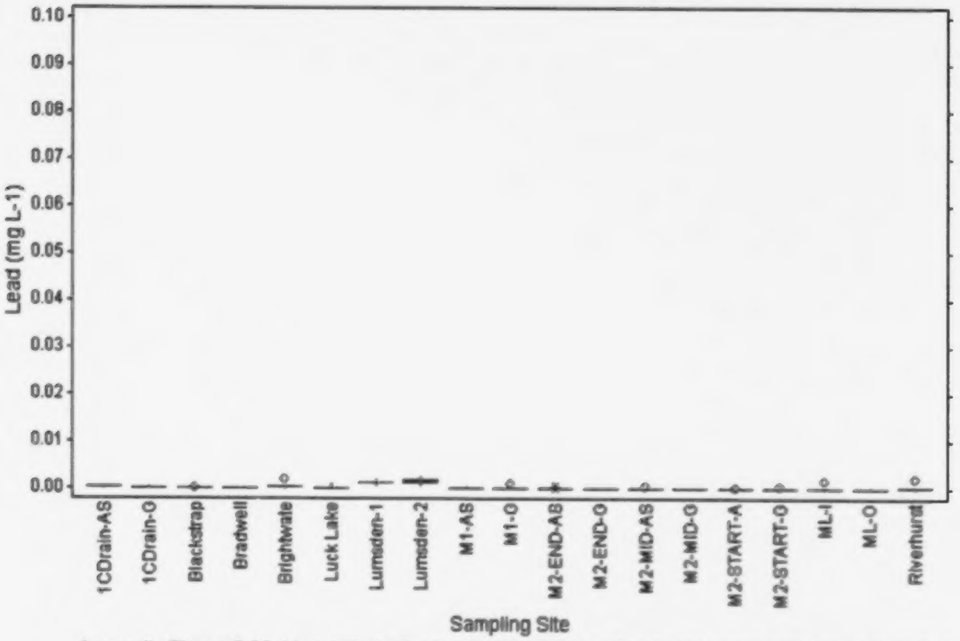
Appendix Figure 6.29. Variability in the cobalt concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; o – probable outlier data value).



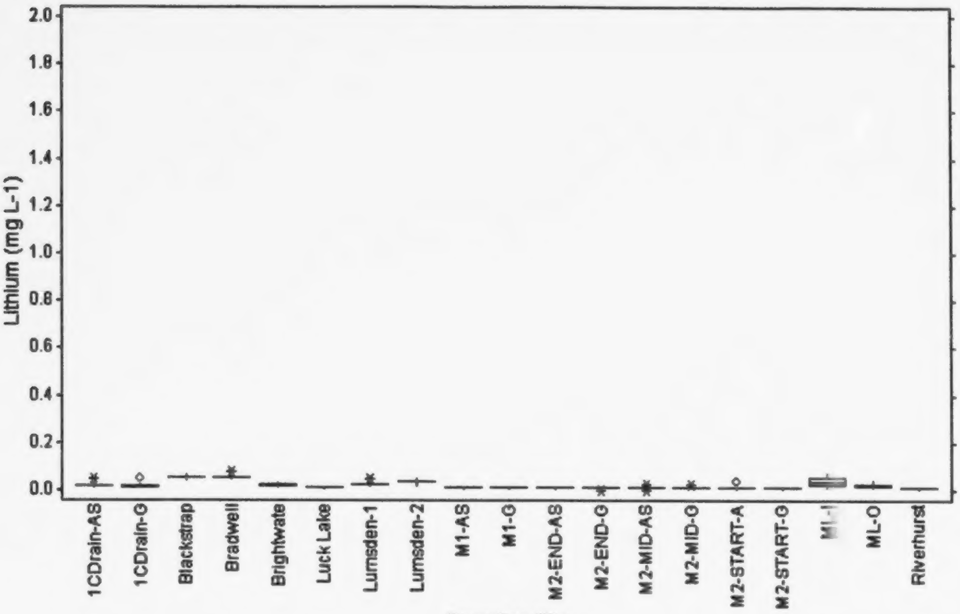
Appendix Figure 6.30. Variability in the copper concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; o – probable outlier data value).



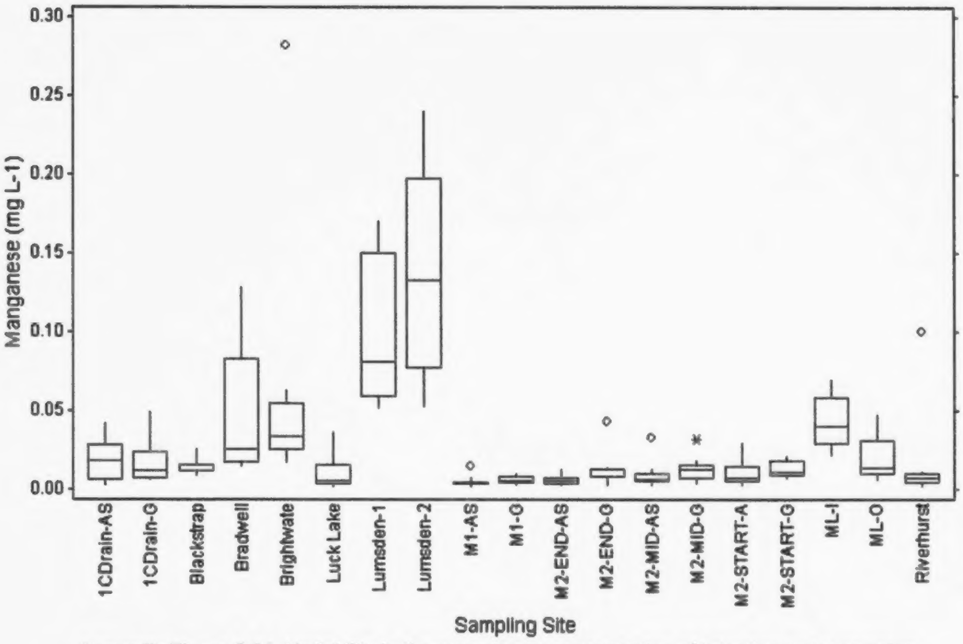
Appendix Figure 6.31. Variability in the iron concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



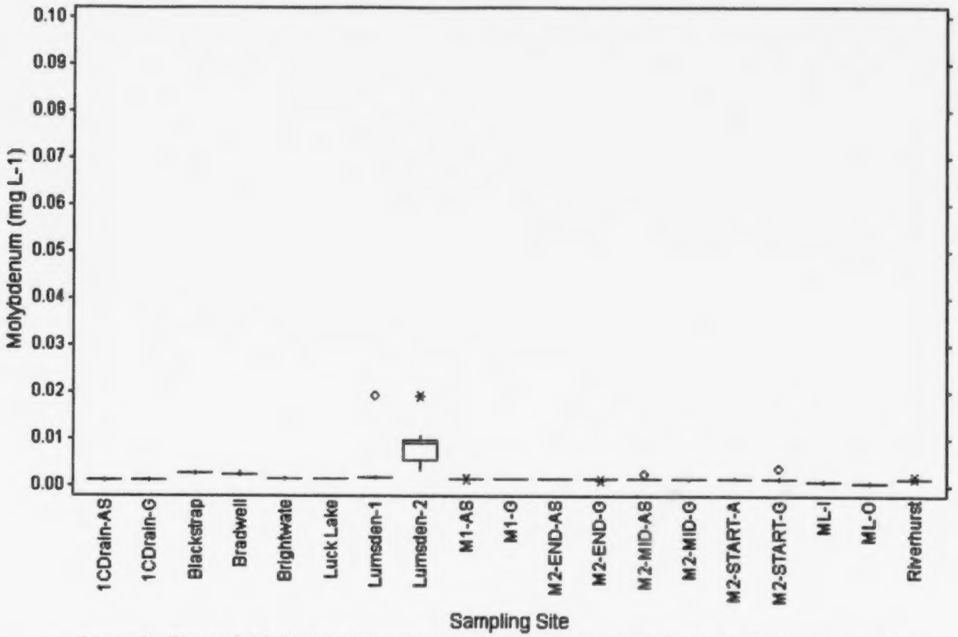
Appendix Figure 6.32. Variability in the lead concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



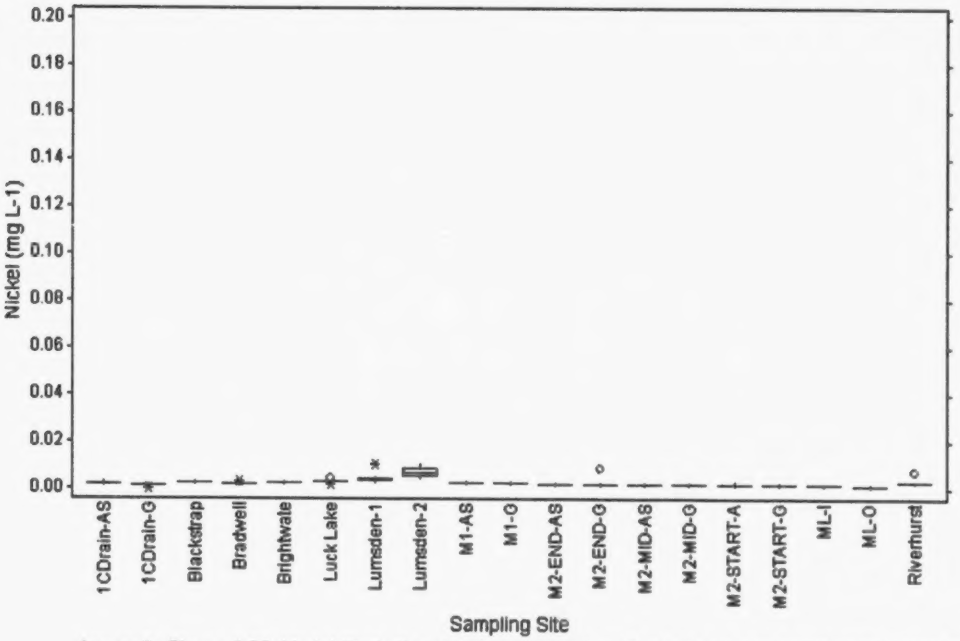
Appendix Figure 6.33. Variability in the iron concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



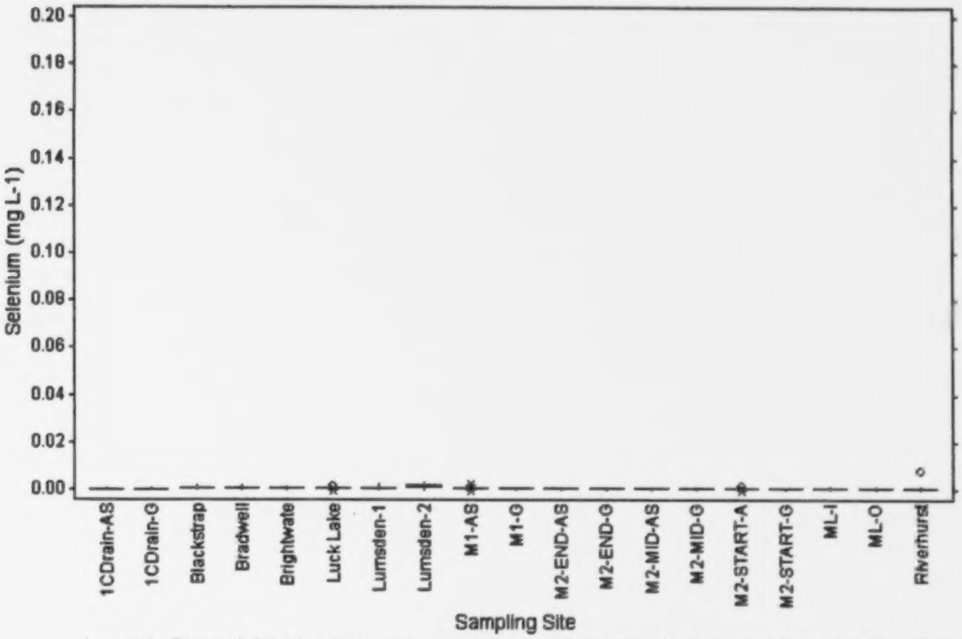
Appendix Figure 6.34. Variability in the manganese concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



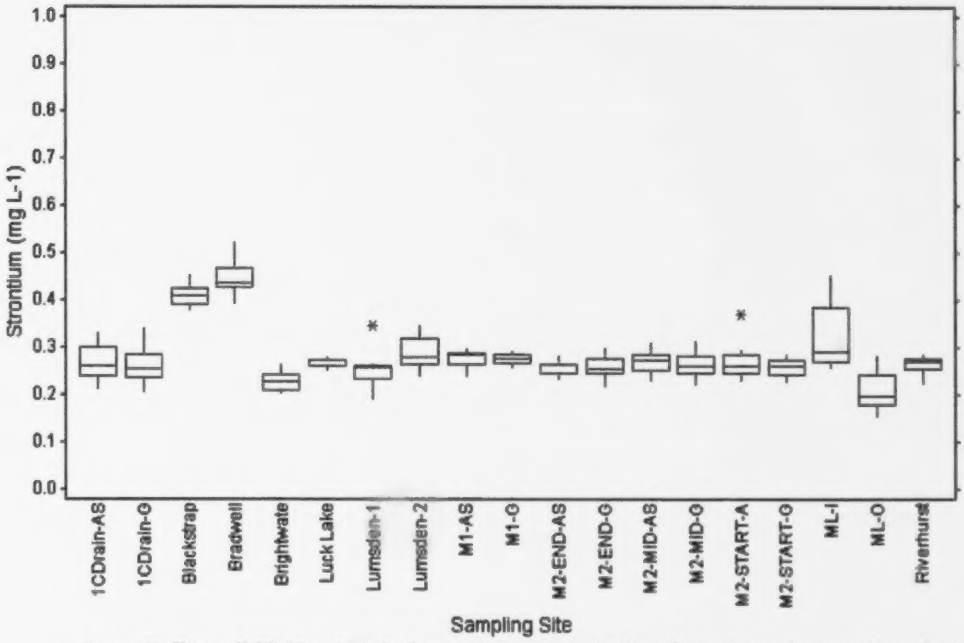
Appendix Figure 6.35. Variability in the molybdenum concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



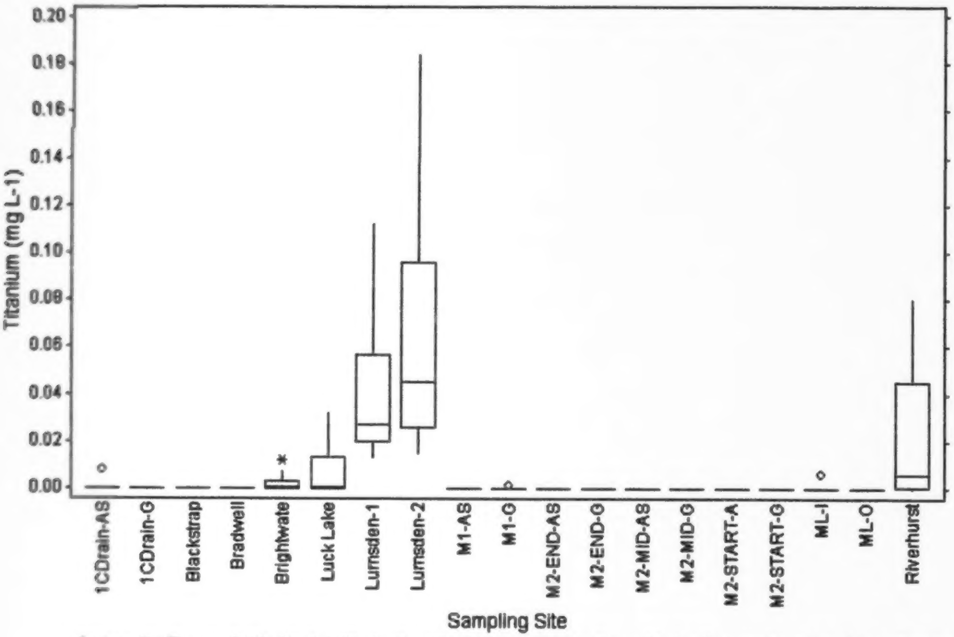
Appendix Figure 6.36. Variability in the nickel concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



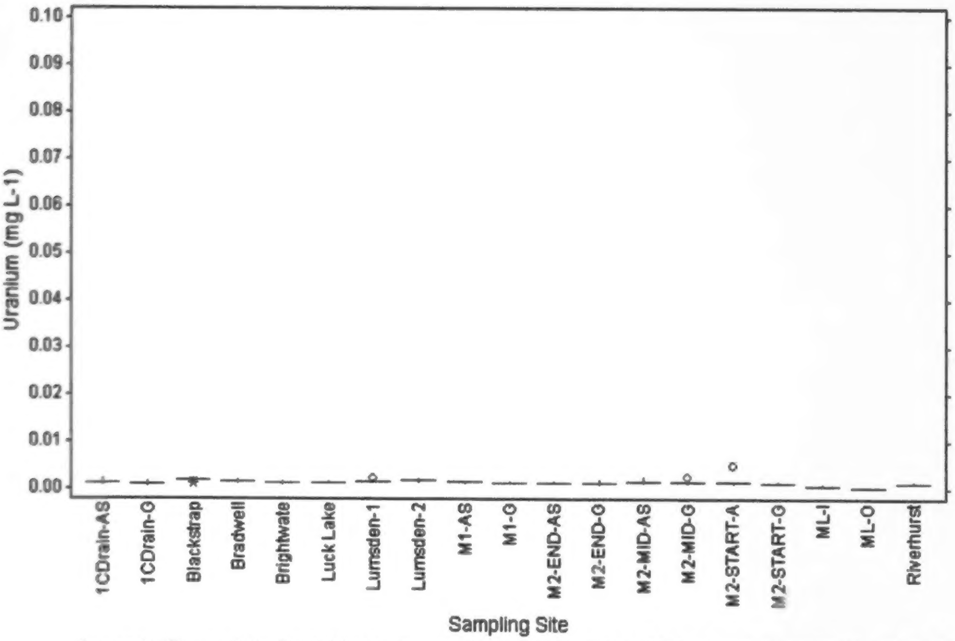
Appendix Figure 6.37. Variability in the selenium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



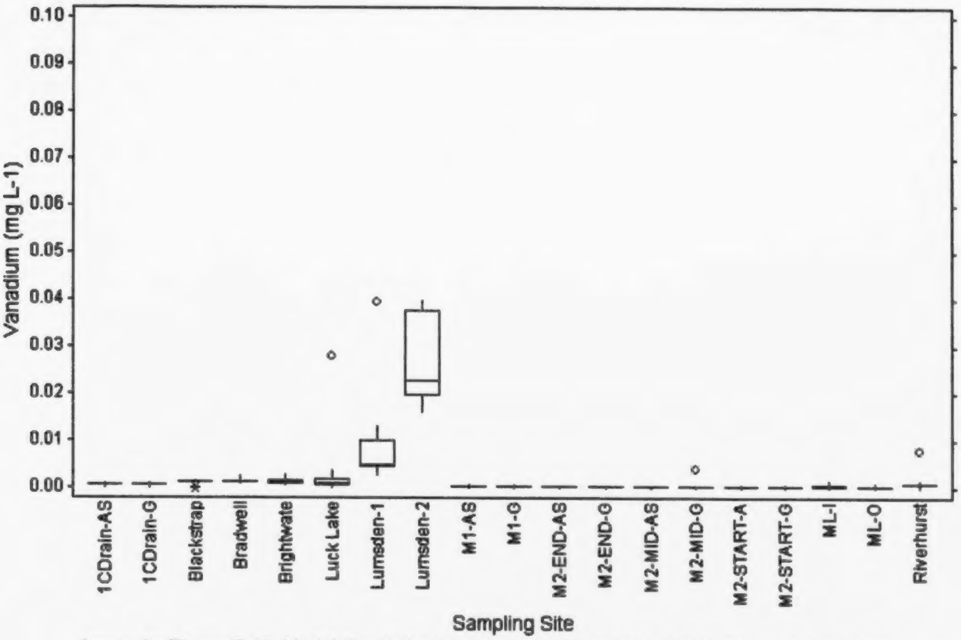
Appendix Figure 6.38. Variability in the strontium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value).



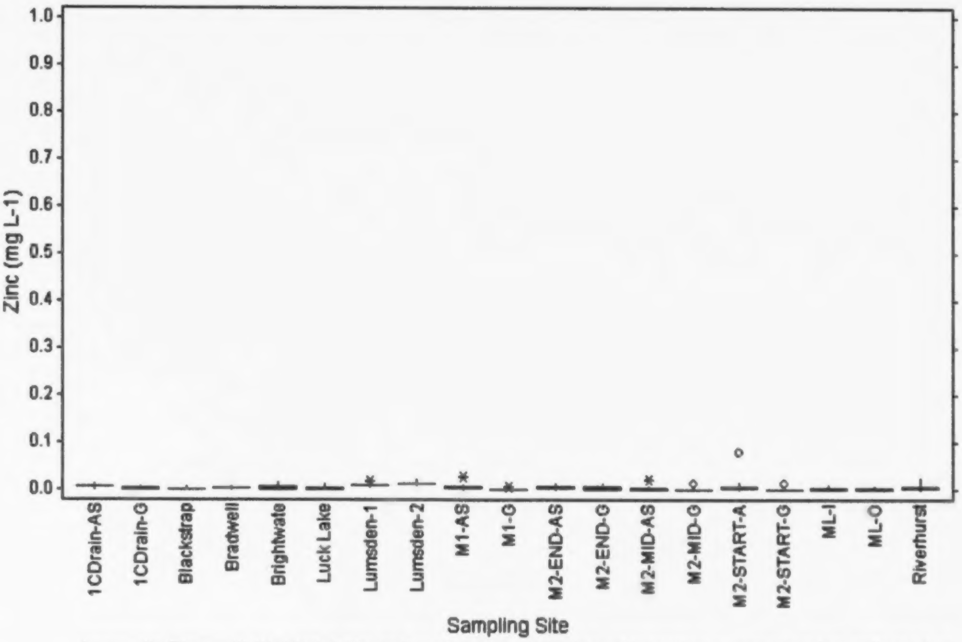
Appendix Figure 6.39. Variability in the titanium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



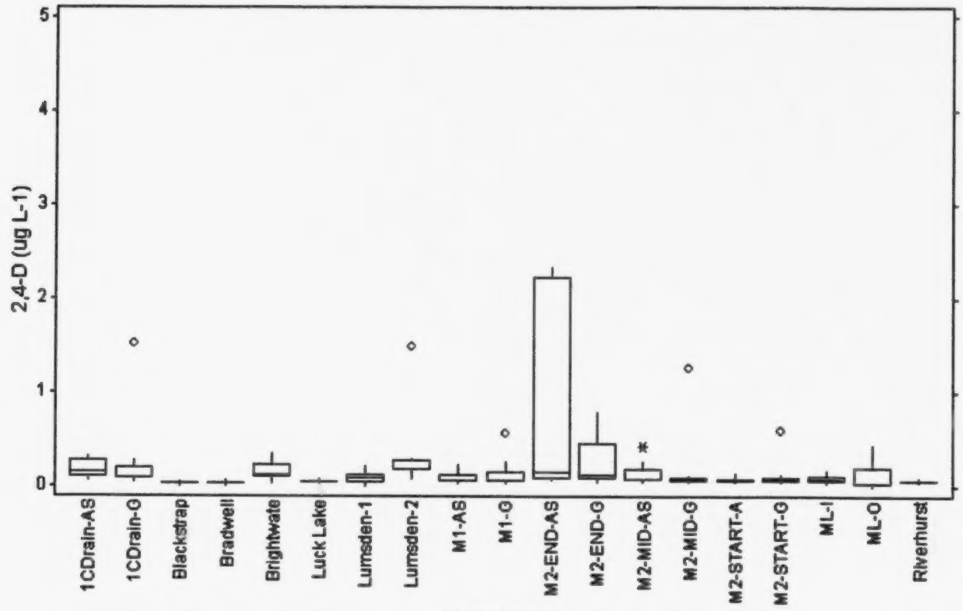
Appendix Figure 6.40. Variability in the uranium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



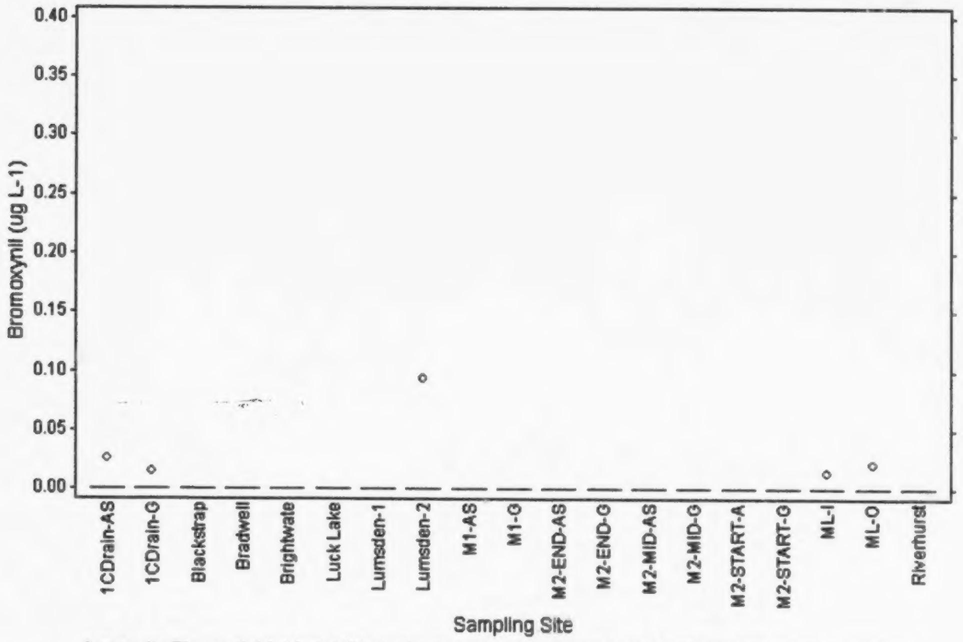
Appendix Figure 6.41. Variability in the vanadium concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



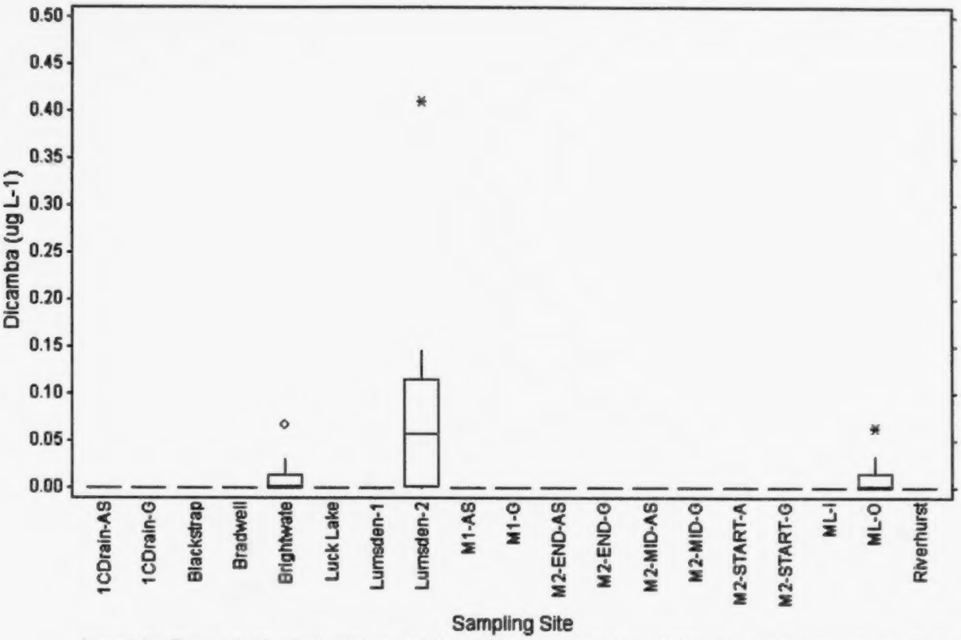
Appendix Figure 6.42. Variability in the zinc concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



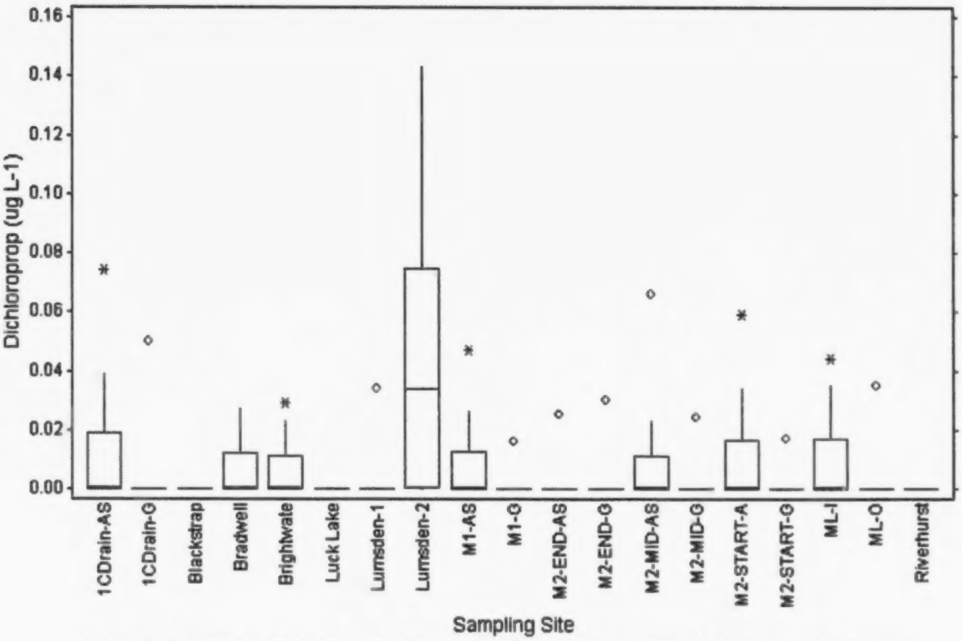
Appendix Figure 6.43. Variability in the 2,4-D concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



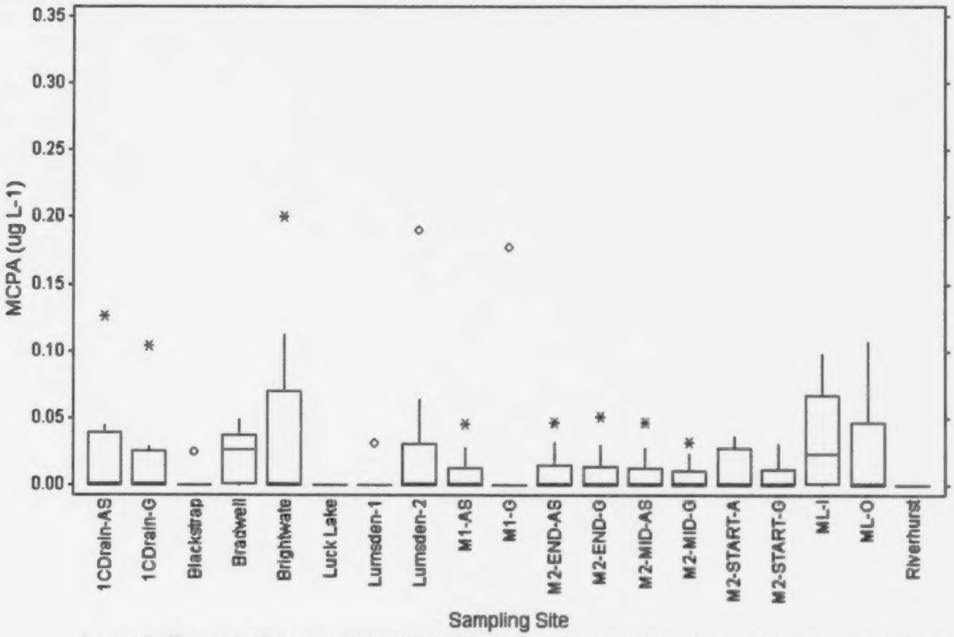
Appendix Figure 6.44. Variability in the bromoxynil concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (○ – probable outlier data value).



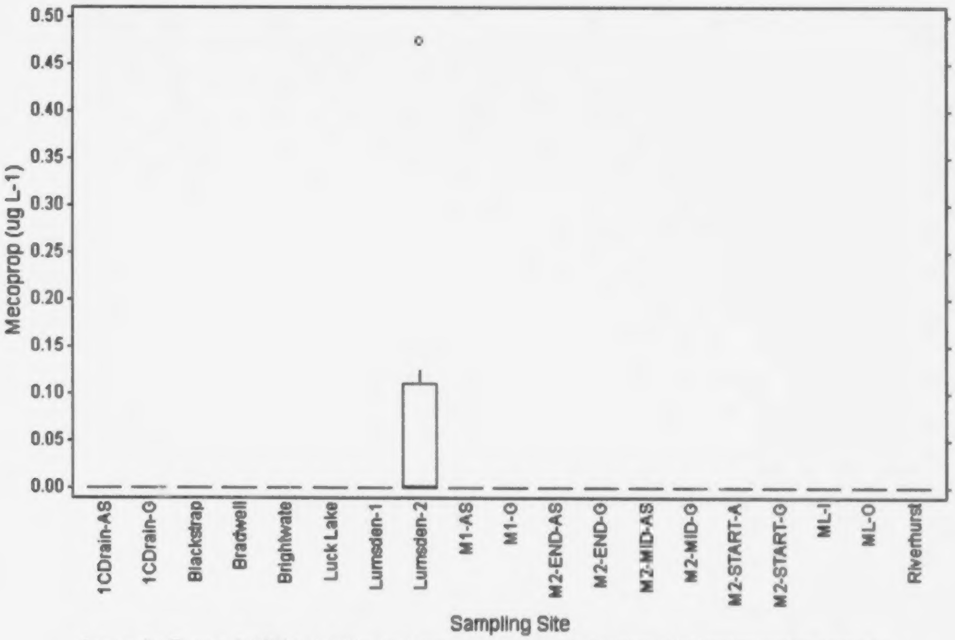
Appendix Figure 6.45. Variability in the dicamba concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



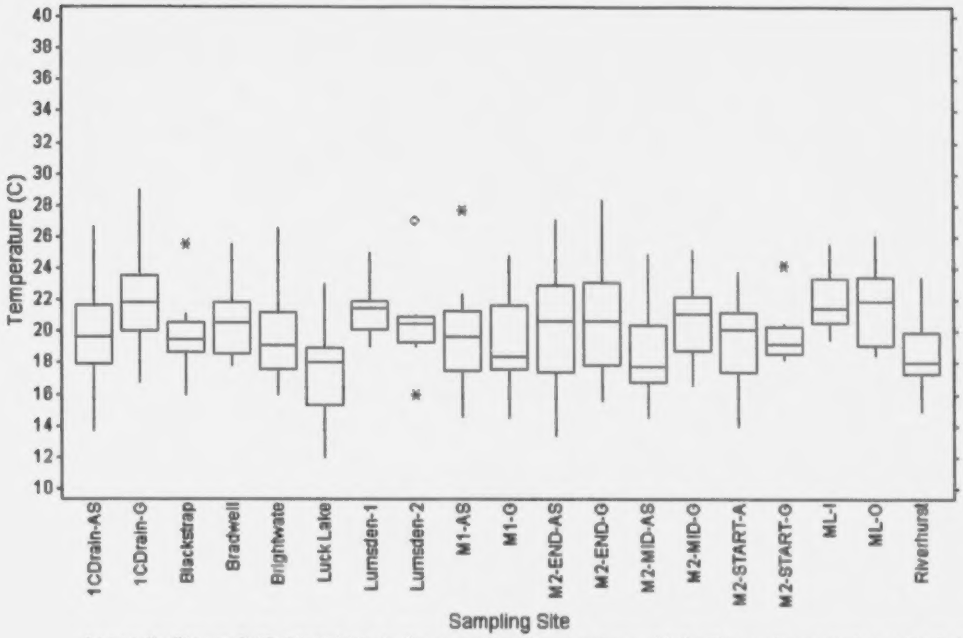
Appendix Figure 6.46. Variability in the dichloroprop concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



Appendix Figure 6.47. Variability in the MCPA concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).



Appendix Figure 6.48. Variability in the mecoprop concentration of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; ○ – probable outlier data value).



Appendix Figure 6.49. Variability in the sampling temperature of irrigation water samples collected at each sampling site for the three year period 2007-2009. (Box represents middle half of data; line bisecting box represents the median value; vertical lines at top and bottom of box represent the range of typical data values; * - possible outlier data value ; ○ – probable outlier data value).

Appendix 7

2007 Meteorological Data

Appendix Table 7.1. Environment Canada Daily Meteorological Data Report for Lucky Lake - 2007

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	18.8	-1.2	8.8	9.2	0	0		
02	23.2	6.7	15.0	3.0	0	0		
03	M	M	M	M	M	0		
04	M	M	M	M	M	0		
05	M	M	M	M	M	0		
06	M	M	M	M	M	0		
07	M	M	M	M	M	0		
08	M	M	M	M	M	0		
09	M	M	M	M	M	0		
10	M	M	M	M	M	0		
11	M	M	M	M	M	0		
12	M	M	M	M	M	0		
13	M	M	M	M	M	0		
14	16.9	5.0	11.0	7.0	0	0.2		
15	17.7	3.9	10.8	7.2	0	0		
16	21.6	0.7	11.2	6.8	0	0		
17	27.7	11.9	19.8	0.0	1.8	0		
18	18.4	0.6	9.5	8.5	0	0		
19	11.0	-1.6	4.7	13.3	0	0.6		
20	19.6	5.7	12.7	5.3	0	0		
21	11.3	6.7	9.0	9.0	0	34.4		
22	8.8	5.8	7.3	10.7	0	1.6		
23	9.5	1.7	5.6	12.4	0	1.0		
24	13.4	0.8	7.1	10.9	0	0		
25	12.8	0.1	6.5	11.5	0	0		
26	19.2	2.3	10.8	7.2	0	0		
27	24.9	7.3	16.1	1.9	0	0.2		
28	18.6	11.3	15.0	3.0	0	2.0		
29	11.7	4.0	7.9	10.1	0	16.4		
30	10.5	4.0	7.3	10.7	0	0		
31	20.0	6.2	13.1	4.9	0	0		
Sum				152.6	1.8	56.4		
Avg	16.8	4.1	10.5					
Xtrm	27.7	-1.6						

Appendix Table 7.1 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
June 01	23.3	11.2	17.3	0.7	0	0		
02	27.1	10.0	18.6	0	0.6	0		
03	26.9	12.1	19.5	0	1.5	1.8		
04	22.7	9.3	16.0	2.0	0	0		
05	26.6	7.2	16.9	1.1	0	0		
06	16.6	6.8	11.7	6.3	0	1.4		
07	17.1	1.9	9.5	8.5	0	0		
08	22.6	7.9	15.3	2.7	0	0		
09	22.0	6.0	14.0	4.0	0	4.0		
10	22.6	11.3	17.0	1.0	0	2.0		
11	24.2	11.5	17.9	0.1	0	3.2		
12	22.6	8.4	15.5	2.5	0	0		
13	22.9	6.9	14.9	3.1	0	0		
14	23.1	8.6	15.9	2.1	0	3.6		
15	20.6	9.3	15.0	3.0	0	0		
16	21.7	5.7	13.7	4.3	0	0		
17	17.6	10.0	13.8	4.2	0	13.2		
18	18.4	7.9	13.2	4.8	0	10.0		
19	20.7	6.3	13.5	4.5	0	0		
20	23.2	7.1	15.2	2.8	0	0		
21	29.6	10.3	20.0	0	2.0	0		
22	28.3	11.1	19.7	0	1.7	0		
23	25.4	10.6	18.0	0	0	0		
24	16.8	7.1	12.0	6.0	0	4.8		
25	16.7	8.1	12.4	5.6	0	17.8		
26	14.2	8.1	11.2	6.8	0	0.4		
27	16.6	3.9	10.3	7.7	0	0		
28	20.0	7.8	13.9	4.1	0	0		
29	23.4	11.1	17.3	0.7	0	0		
30	24.7	12.0	18.4	0	0.4	3.2		
Sum				**88.6**	**6.2**	**65.4**		
Avg	**21.9**	**8.5**	**15.3**					
Xtrm	**29.6**	**1.9**						

Appendix Table 7.1 (continued)								
Month/Day	**Max Temp °C**	**Min Temp °C**	**Mean Temp °C**	**Heat Deg Days °C**	**Cool Deg Days °C**	**Total Precip mm**	**Dir of Max Gust 10's Deg**	**Spd of Max Gust km/h**
July 01	26.5	10.7	18.6	0	0.6	0		
02	28.3	9.5	18.9	0	0.9	0		
03	28.1	14.4	21.3	0	3.3	0		
04	26.6	14.3	20.5	0	2.5	0.8		
05	31.5	12.4	22.0	0	4.0	0		
06	34.8	20.6	27.7	0	9.7	0		
07	25.5	11.6	18.6	0	0.6	0		
08	22.9	10.1	16.5	1.5	0	0		
09	19.6	11.3	15.5	2.5	0	6.4		
10	22.7	8.3	15.5	2.5	0	0		
11	23.4	8.8	16.1	1.9	0	0		
12	28.9	11.7	20.3	0	2.3	0		
13	33.4	14.6	24.0	0	6.0	0		
14	32.6	13.5	23.1	0	5.1	0		
15	30.0	14.5	22.3	0	4.3	0		
16	30.0	17.3	23.7	0	5.7	2.6		
17	31.0	14.3	22.7	0	4.7	0		
18	30.0	14.3	22.2	0	4.2	0		
19	31.0	17.0	24.0	0	6.0	0		
20	29.1	16.8	23.0	0	5.0	40.6		
21	29.4	16.9	23.2	0	5.2	0.2		
22	31.6	15.4	23.5	0	5.5	0		
23	35.9	15.8	25.9	0	7.9	0		
24	28.9	19.3	24.1	0	6.1	0		
25	21.8	M	M	M	M	0		
26	24.9	M	M	M	M	0		
27	32.5	11.5	22.0	0	4.0	0		
28	35.1	18.4	26.8	0	8.8	0		
29	36.8	11.7	24.3	0	6.3	0		
30	35.9	15.7	25.8	0	7.8	0		
31	27.8	10.7	19.3	0	1.3	0		
Sum				**8.4**	**117.8**	**50.6**		
Avg	**29.2**	**13.8**	**21.8**					
Xtrm	**36.8**	**8.3**						

Appendix Table 7.1 (continued)								
Month/Day	**Max Temp °C**	**Min Temp °C**	**Mean Temp °C**	**Heat Deg Days °C**	**Cool Deg Days °C**	**Total Precip mm**	**Dir of Max Gust 10's Deg**	**Spd of Max Gust km/h**
August 01	24.5	9.9	17.2	0.8	0	0		
02	28.0	7.8	17.9	0.1	0	0		
03	31.9	9.1	20.5	0	2.5	0		
04	27.5	15.5	21.5	0	3.5	0		
05	25.5	11.9	18.7	0	0.7	0		
06	23.4	13.1	18.3	0	0.3	5.4		
07	32.4	11.1	21.8	0	3.8	0		
08	27.4	14.7	21.1	0	3.1	0		
09	22.0	11.6	16.8	1.2	0	1.0		
10	16.4	9.3	12.9	5.1	0	11.8		
11	18.2	8.6	13.4	4.6	0	0		
12	25.5	7.5	16.5	1.5	0	0		
13	25.2	8.6	16.9	1.1	0	0		
14	19.1	8.4	13.8	4.2	0	0.2		
15	21.0	6.5	13.8	4.2	0	0		
16	22.5	4.7	13.6	4.4	0	0		
17	26.6	11.1	18.9	0	0.9	0		
18	20.1	13.2	16.7	1.3	0	0		
19	23.2	14.5	18.9	0	0.9	0		
20	20.7	7.6	14.2	3.8	0	5.8		
21	23.2	8.1	15.7	2.3	0	0		
22	15.6	6.9	11.3	6.7	0	0		
23	16.2	3.6	9.9	8.1	0	0		
24	21.0	0.8	10.9	7.1	0	0		
25	29.7	8.4	19.1	0	1.1	0		
26	16.1	9.3	12.7	5.3	0	0		
27	16.3	7.8	12.1	5.9	0	1.6		
28	18.5	5.1	11.8	6.2	0	0		
29	27.4	3.7	15.6	2.4	0	0		
30	30.1	7.0	18.6	0	0.6	0		
31	34.3	13.3	23.9	0	5.9	0		
Sum				**76.3**	**23.3**	**25.8**		
Avg	**23.5**	**9.0**	**16.3**					
Xtrm	**34.4**	**0.8**						

Appendix Table 7.2. Environment Canada Daily Meteorological Data Report for Outlook PFRA - 2007

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	18.2	-0.7	8.8	9.2	0	0		
02	21.9	6.8	14.4	3.6	0	0.7		
03	M	M	M	M	M	0		
04	M	M	M	M	M	0		
05	M	M	M	M	M	0		
06	M	M	M	M	M	0		
07	M	M	M	M	M	0		
08	M	M	M	M	M	0		
09	M	M	M	M	M	0		
10	M	M	M	M	M	0		
11	M	M	M	M	M	0		
12	M	M	M	M	M	0		
13	M	M	M	M	M	0		
14	17.8	7.7	12.8	5.2	0	0		
15	17.3	5.1	11.2	6.8	0	0		
16	22.2	-0.6	10.8	7.2	0	0		
17	27.5	9.4	18.5	0	0.5	0		
18	16.9	1.5	9.2	8.8	0	0		
19	11.6	-0.2	5.7	12.3	0	1.8		
20	17.3	6.3	11.8	6.2	0	0.4		
21	10.2	7.2	8.7	9.3	0	11.4		
22	10.9	6.6	8.8	9.2	0	0.8		
23	10.3	3.6	7.0	11.0	0	0.6		
24	14.0	2.8	8.4	9.6	0	0.8		
25	14.6	0.0	7.3	10.7	0	0		
26	19.3	0.6	10.0	8.0	0	0		
27	25.0	7.4	16.2	1.8	0	0		
28	17.3	11.9	14.6	3.4	0	2.6		
29	12.5	4.8	8.7	9.3	0	12.6		
30	12.0	4.7	8.4	9.6	0	0		
31	21.8	6.9	14.4	3.6	0	0		
Sum				**144.8**	**0.5**	**31.7**		
Avg	**16.9**	**4.6**	**10.8**					
Xtrm	**27.5**	**-0.7**						

Appendix Table 7.2 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
June 01	24.6	9.3	17.0	1.0	0	0		
02	28.6	9.9	19.3	0	1.3	0		
03	24.9	11.9	18.4	0	0.4	0		
04	22.7	9.3	16.0	2.0	0	1.0		
05	26.6	6.3	16.5	1.5	0	0		
06	14.1	8.3	11.2	6.8	0	2.0		
07	18.4	4.0	11.2	6.8	0	0		
08	23.0	7.3	15.2	2.8	0	0		
09	22.9	5.6	14.3	3.7	0	0		
10	21.1	11.3	16.2	1.8	0	1.6		
11	M	M	M	M	M	M		
12	M	M	M	M	M	0		
13	23.0	6.5	14.8	3.2	0	0		
14	23.6	M	M	M	M	2.4		
15	20.9	6.3	13.6	4.4	0	0		
16	21.9	5.1	13.5	4.5	0	0		
17	16.2	10.9	13.6	4.4	0	19.4		
18	18.6	8.2	13.4	4.6	0	14.6		
19	21.7	6.1	13.9	4.1	0	0		
20	22.4	8.6	15.5	2.5	0	0		
21	29.8	8.0	18.9	0	0.9	0		
22	28.0	12.4	20.2	0	2.2	0		
23	25.9	12.8	19.4	0	1.4	0		
24	19.9	7.0	13.5	4.5	0	0		
25	16.6	7.4	12.0	6.0	0	11.8		
26	14.3	7.4	10.9	7.1	0	0.8		
27	16.9	3.6	10.3	7.7	0	0		
28	19.2	7.2	13.2	4.8	0	0		
29	22.3	10.7	16.5	1.5	0	0		
30	25.0	12.2	18.6	0	0.6	10.8		
Sum				**85.7**	**6.8**	**64.4**		
Avg	**21.9**	**8.3**	**15.1**					
Xtrm	**29.8**	**3.6**						

Appendix Table 7.2 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	26.3	9.1	17.7	0.3	0	0		
02	28.7	8.3	18.5	0	0.5	0		
03	27.2	13.0	20.1	0	2.1	0		
04	26.1	15.4	20.8	0	2.8	0.6		
05	29.9	11.5	20.7	0	2.7	0		
06	31.8	18.2	25.0	0	7.0	0		
07	24.1	14.5	19.3	0	1.3	5.2		
08	21.6	10.1	15.9	2.1	0	0		
09	18.6	11.6	15.1	2.9	0	4.4		
10	21.2	8.2	14.7	3.3	0	0		
11	22.4	10.2	16.3	1.7	0	0		
12	27.4	11.8	19.6	0	1.6	0		
13	30.8	15.0	22.9	0	4.9	0		
14	31.1	14.0	22.6	0	4.6	0		
15	27.3	14.3	20.8	0	2.8	0		
16	27.8	16.7	22.3	0	4.3	0		
17	28.8	16.7	22.8	0	4.8	0		
18	29.0	13.7	21.4	0	3.4	0		
19	30.0	17.6	23.8	0	5.8	0		
20	28.7	15.8	22.3	0	4.3	10.0		
21	29.5	17.7	23.6	0	5.6	0.6		
22	32.6	14.8	23.7	0	5.7	0		
23	36.4	16.1	26.3	0	8.3	0		
24	30.2	18.4	24.3	0	6.3	0.2		
25	22.7	15.4	19.1	0	1.1	0.6		
26	26.8	9.5	18.2	0	0.2	0		
27	33.2	9.8	21.5	0	3.5	0		
28	34.8	16.1	25.5	0	7.5	0		
29	36.8	16.6	26.7	0	8.7	0		
30	36.0	16.7	26.4	0	8.4	0		
31	24.7	11.7	18.2	0	0.2	16.8		
Sum				10.3	108.4	38.4		
Avg	28.5	13.8	21.2					
Xtrm	36.8	8.2						

Appendix Table 7.2 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	23.6	9.0	16.3	1.7	0	0		
02	26.9	9.6	18.3	0	0.3	0		
03	31.5	10.2	20.9	0	2.9	0		
04	26.9	15.2	21.1	0	3.1	0		
05	25.2	12.1	18.7	0	0.7	0		
06	22.5	11.5	17.0	1.0	0	4.2		
07	31.7	10.5	21.1	0	3.1	0		
08	26.8	15.4	21.1	0	3.1	0		
09	18.1	11.5	14.8	3.2	0	2.8		
10	16.6	10.3	13.5	4.5	0	9.4		
11	18.2	7.6	12.9	5.1	0	0		
12	23.7	6.8	15.3	2.7	0	0		
13	23.7	9.6	16.7	1.3	0	0		
14	18.3	7.7	13.0	5.0	0	0		
15	20.1	8.5	14.3	3.7	0	0		
16	21.9	5.8	13.9	4.1	0	0		
17	24.2	7.8	16.0	2.0	0	5.6		
18	17.8	11.6	14.7	3.3	0	12.8		
19	22.1	13.6	17.9	0.1	0	M		
20	18.3	10.9	14.6	3.4	0	0		
21	21.6	9.6	15.6	2.4	0	0		
22	13.8	7.9	10.9	7.1	0	0.4		
23	14.9	5.3	10.1	7.9	0	0		
24	19.5	2.0	10.8	7.2	0	0		
25	28.8	6.8	17.8	0.2	0	0		
26	16.4	9.8	13.1	4.9	0	0		
27	16.2	8.2	12.2	5.8	0	1.2		
28	18.0	5.6	11.8	6.2	0	0		
29	25.0	2.6	13.8	4.2	0	0		
30	28.3	6.2	17.3	0.7	0	0		
31	33.7	15.0	24.4	0	6.4	0		
Sum				87.7	19.6	36.4		
Avg	22.4	9.2	15.8					
Xtrm	33.7	2.0						

Appendix Table 7.3. Environment Canada Daily Meteorological Data Report for Saskatoon - 2007

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	17.0	-0.6	8.2	9.8	0	0		
02	21.3	8.8	15.1	2.9	0	0		
03	24.2	10.0	17.1	0.9	0	1.0		
04	15.3	8.0	11.7	6.3	0	2.0		
05	18.1	1.6	9.9	8.1	0	0		
06	20.2	3.4	11.8	6.2	0	0		
07	20.9	4.4	12.7	5.3	0	0		
08	23.8	6.4	15.1	2.9	0	0		
09	20.7	1.6	11.2	6.8	0	0		
10	15.1	-2.8	6.2	11.8	0	0		
11	19.4	5.1	12.3	5.7	0	0		
12	23.7	4.7	14.2	3.8	0	15.0		
13	15.8	6.4	11.1	6.9	0	0		
14	18.4	5.1	11.8	6.2	0	0		
15	16.9	3.5	10.2	7.8	0	0		
16	21.9	2.0	12.0	6.0	0	0		
17	25.5	9.9	17.7	0.3	0	0		
18	13.9	0.2	7.1	10.9	0	0		
19	13.2	-0.2	6.5	11.5	0	1.5		
20	14.6	6.8	10.7	7.3	0	0		
21	8.9	6.7	7.8	10.2	0	4.0		
22	13.0	6.5	9.8	8.2	0	0.5		
23	11.6	4.1	7.9	10.1	0	0		
24	12.8	3.7	8.3	9.7	0	0		
25	16.0	1.4	8.7	9.3	0	0		
26	20.2	2.3	11.3	6.7	0	0		
27	24.7	7.6	16.2	1.8	0	0		
28	17.7	12.3	15.0	3.0	0	4.0		
29	12.7	4.3	8.5	9.5	0	18.0		
30	13.8	4.2	9.0	9.0	0	0		
31	22.1	4.9	13.5	4.5	0	0		
Sum				209.4	0	46.0		
Avg	17.9	4.6	11.2					
Xtrm	25.5	-2.8						

Appendix Table 7.3 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
June 01	25.6	8.1	16.9	1.1	0	0		
02	28.6	9.8	19.2	0	1.2	0		
03	24.6	10.7	17.7	0.3	0	0		
04	20.7	8.9	14.8	3.2	0	0		
05	26.1	7.2	16.7	1.3	0	0		
06	15.4	4.1	9.8	8.2	0	0.6		
07	17.6	1.1	9.4	8.6	0	0		
08	23.0	4.7	13.9	4.1	0	0		
09	19.2	4.7	12.0	6.0	0	0.4		
10	18.9	9.3	14.1	3.9	0	0		
11	25.4	11.4	18.4	0	0.4	2.6		
12	24.4	8.3	16.4	1.6	0	0		
13	23.0	9.2	16.1	1.9	0	0		
14	22.7	8.6	15.7	2.3	0	0		
15	20.5	5.3	12.9	5.1	0	0		
16	22.8	5.0	13.9	4.1	0	0		
17	15.7	11.0	13.4	4.6	0	86.4		
18	18.9	8.6	13.8	4.2	0	15.6		
19	21.1	7.3	14.2	3.8	0	0		
20	21.4	9.9	15.7	2.3	0	0.4		
21	27.5	9.1	18.3	0	0.3	0		
22	25.4	10.9	18.2	0	0.2	0		
23	25.6	10.2	17.9	0.1	0	0		
24	21.5	7.7	14.6	3.4	0	0		
25	16.1	8.0	12.1	5.9	0	8.6		
26	15.0	5.7	10.4	7.6	0	7.4		
27	18.1	3.6	10.9	7.1	0	0		
28	20.0	9.2	14.6	3.4	0	0		
29	23.7	11.3	17.5	0.5	0	0		
30	25.5	14.6	20.1	0	2.1	9.0		
Sum				94.6	4.2	131.0		
Avg	21.8	8.1	15.0					
Xtrm	28.6	1.1						

Appendix Table 7.3 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	26.5	12.1	19.3	0	1.3	0		
02	M	11.4	M	M	M	0		
03	M	M	M	M	M	M		
04	25.4	15.3	20.4	0	2.4	0		
05	28.9	12.4	20.7	0	2.7	0		
06	30.6	18.8	24.7	0	6.7	0.5		
07	24.8	13.0	18.9	0	0.9	1.5		
08	22.1	9.5	15.8	2.2	0	0		
09	18.6	11.4	15.0	3.0	0	13.0		
10	21.2	7.9	14.6	3.4	0	0		
11	23.2	8.6	15.9	2.1	0	0		
12	27.5	11.0	19.3	0	1.3	0		
13	31.0	15.2	23.1	0	5.1	0		
14	29.8	14.2	22.0	0	4.0	0		
15	26.4	17.3	21.9	0	3.9	0.5		
16	27.2	17.4	22.3	0	4.3	0		
17	27.9	17.1	22.5	0	4.5	0		
18	28.5	14.5	21.5	0	3.5	0		
19	M	18.0	M	M	M	0		
20	28.4	16.8	22.6	0	4.6	1.0		
21	29.3	18.2	23.8	0	5.8	4.0		
22	30.8	15.1	23.0	0	5.0	0		
23	M	17.0	M	M	M	0		
24	31.0	21.2	26.1	0	8.1	0		
25	25.4	14.0	19.7	0	1.7	0		
26	26.9	9.5	18.2	0	0.2	0		
27	31.4	15.3	23.4	0	5.4	0		
28	32.3	14.3	23.3	0	5.3	0		
29	32.9	15.9	24.4	0	6.4	0		
30	35.0	19.0	27.0	0	9.0	0		
31	23.7	10.5	17.1	0.9	0	1.5		
Sum				11.6	92.1	22.0		
Avg	27.7	14.4	21.0					
Xtrm	35.0	7.9						

Appendix Table 7.3 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	23.5	7.8	15.7	2.3	0	0		
02	27.1	8.3	17.7	0.3	0	0		
03	31.0	14.8	22.9	0	4.9	0		
04	27.5	14.1	20.8	0	2.8	0		
05	25.3	12.0	18.7	0	0.7	0		
06	23.0	10.6	16.8	1.2	0	0.5		
07	32.4	11.9	22.2	0	4.2	0		
08	27.5	11.6	19.6	0	1.6	0		
09	18.6	11.8	15.2	2.8	0	2.0		
10	16.3	11.0	13.7	4.3	0	4.5		
11	20.2	10.0	15.1	2.9	0	8.0		
12	23.6	8.1	15.9	2.1	0	1.0		
13	24.1	7.9	16.0	2.0	0	0		
14	20.0	4.8	12.4	5.6	0	0		
15	19.9	6.5	13.2	4.8	0	0		
16	22.0	5.2	13.6	4.4	0	0		
17	22.1	9.4	15.8	2.2	0	0		
18	M	M	M	M	M	M		
19	M	M	M	M	M	M		
20	M	M	M	M	M	M		
21	M	M	M	M	M	M		
22	14.2	9.2	11.7	6.3	0	0.5		
23	15.3	7.2	11.3	6.7	0	0		
24	18.8	4.2	11.5	6.5	0	0.5		
25	26.9	7.7	17.3	0.7	0	0.5		
26	15.2	6.5	10.9	7.1	0	0		
27	18.2	6.4	12.3	5.7	0	0		
28	17.8	7.0	12.4	5.6	0	0		
29	20.2	4.7	12.5	5.5	0	0		
30	26.2	6.9	16.6	1.4	0	0		
31	31.3	16.4	23.9	0	5.9	0		
Sum				80.4	20.1	17.5		
Avg	22.5	9.0	15.8					
Xtrm	32.4	4.2						

Appendix Table 7.4. Environment Canada Daily Meteorological Data Report for Regina - 2007

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	18.6	-3.7	7.5	10.5	0	0		
02	21.9	8.3	15.1	2.9	0	0		
03	26.4	10.7	18.6	0	0.6	9.0		
04	17.8	6.5	12.2	58	0	2.0		
05	19.5	1.0	10.3	7.7	0	0		
06	17.9	3.6	10.8	7.2	0	0		
07	24.4	-0.2	12.1	5.9	0	0		
08	27.4	4.9	16.2	1.8	0	0		
09	27.7	4.6	16.2	1.8	0	0		
10	14.0	0.5	7.3	10.7	0	0		
11	13.1	6.2	9.7	8.3	0	0		
12	25.1	4.8	15.0	3.0	0	0		
13	23.5	7.7	15.6	2.4	0	11.5		
14	13.5	5.2	9.4	8.6	0	6.5		
15	16.3	0.7	8.5	9.5	0	0		
16	19.8	-2.0	8.9	9.1	0	0		
17	29.1	6.7	17.9	0.1	0	0		
18	22.3	1.8	12.1	5.9	0	0		
19	13.3	-0.7	6.3	11.7	0	2.5		
20	23.6	61	14.9	3.1	0	05		
21	14.6	9.8	12.2	5.8	0	18.0		
22	9.8	8.0	8.9	9.1	0	1.0		
23	8.0	1.9	5.0	13.0	0	20.5		
24	11.7	2.7	7.2	10.8	0	0.5		
25	14.0	-1.5	6.3	11.7	0	0		
26	17.9	-0.6	8.7	9.3	0	0		
27	23.3	2.9	13.1	4.9	0	0		
28	24.0	9.7	16.9	1.1	0	0		
29	16.9	8.8	12.9	5.1	0	0		
30	12.4	7.5	10.0	8.0	0	0		
31	14.2	9.8	12.0	6.0	0	11.0		
Sum				**200.8**	**0**	**83.0**		
Avg	**18.8**	**4.2**	**11.5**					
Xtrm	**29.1**	**-3.7**						

Appendix Table 7.4 (continued)								
Month/Day	**Max Temp °C**	**Min Temp °C**	**Mean Temp °C**	**Heat Deg Days °C**	**Cool Deg Days °C**	**Total Precip mm**	**Dir of Max Gust 10's Deg**	**Spd of Max Gust km/h**
June 01	18.8	11.5	15.2	2.8	0	1.0		
02	26.8	11.3	19.1	0	1.1	0		
03	28.2	10.3	19.3	0	1.3	1.0		
04	22.2	7.7	15.0	30	0	0		
05	25.8	7.1	16.5	1.5	0	0		
06	17.3	9.7	13.5	4.5	0	0.4		
07	17.5	2.5	10.0	8.0	0	0.6		
08	22.7	2.7	12.7	5.3	0	0		
09	23.6	4.6	14.1	3.9	0	1.4		
10	23.9	11.4	17.7	0.3	0	1.0		
11	28.1	11.8	20.0	0	0	1.6		
12	24.5	7.2	15.9	2.1	0	0.4		
13	24.7	5.4	15.1	2.9	0	0		
14	21.5	9.1	15.3	2.7	0	4.0		
15	21.9	9.5	15.7	2.3	0	1.0		
16	23.8	5.5	14.7	3.3	0	0		
17	18.1	7.4	12.8	5.2	0	9.0		
18	16.8	5.2	11.0	7.0	0	1.6		
19	24.3	3.7	14.0	4.0	0	0		
20	28.4	5.5	17.0	1.0	0	0		
21	28.5	12.7	20.6	0	2.6	1.0		
22	31.0	14.0	22.5	0	4.5	0		
23	30.4	15.9	23.2	0	5.2	0		
24	21.6	10.6	16.1	1.9	0	0		
25	21.9	13.3	17.6	0.4	0	1.4		
26	18.1	9.4	13.8	4.2	0	0		
27	18.1	4.8	11.5	6.5	0	0		
28	20.2	4.4	12.3	5.7	0	0		
29	24.8	11.1	18.0	0	0	0		
30	28.6	16.1	22.4	0	4.4	1.0		
Sum				**78.5**	**21.1**	**26.4**		
Avg	**23.4**	**8.7**	**16.1**					
Xtrm	**31.0**	**2.5**						

Appendix Table 7.4 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	28.8	11.5	20.2	0	2.2	0		
02	31.2	14.9	23.1	0	5.1	0		
03	27.5	12.1	19.8	0	1.8	0		
04	28.2	12.1	20.2	0	2.2	0		
05	29.0	9.4	19.2	0	1.2	0		
06	37.2	14.5	25.9	0	7.9	1.5		
07	29.8	14.3	22.1	0	4.1	0		
08	24.1	8.4	16.3	1.7	0	0		
09	18.8	11.5	15.2	2.8	0	9.0		
10	20.9	9.7	15.3	2.7	0	1.0		
11	25.2	8.0	16.6	1.4	0	0		
12	25.9	10.7	18.3	0	0.3	0		
13	32.1	11.6	21.9	0	3.9	0		
14	30.1	11.9	21.0	0	3.0	0		
15	29.3	15.2	22.3	0	4.3	0		
16	27.8	15.7	21.8	0	3.8	0.5		
17	27.9	14.9	21.4	0	3.4	0		
18	30.5	14.4	22.5	0	4.5	0		
19	M	16.5	M	M	M	0		
20	32.4	15.7	24.1	0	6.1	1.5		
21	28.4	16.5	22.5	0	4.5	17.5		
22	35.1	17.7	26.4	0	8.4	0		
23	35.5	19.9	27.7	0	9.7	0		
24	36.7	20.4	28.6	0	10.6	0.5		
25	26.8	17.4	22.1	0	4.1	4.5		
26	27.5	10.7	19.1	0	1.1	0		
27	30.3	12.1	21.2	0	3.2	0		
28	36.4	16.5	26.5	0	8.5	0		
29	36.9	13.9	25.4	0	7.4	0		
30	35.5	13.0	24.3	0	6.3	0		
31	36.5	16.2	26.4	0	8.4	0		
Sum				8.6	126.0	36.0		
Avg	30.1	13.8	21.9					
Xtrm	37.2	8.0						

Appendix Table 7.4 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	25.8	9.7	17.8	0.2	0	0		
02	28.2	7.2	17.7	0.3	0	0		
03	31.4	12.5	22.0	0	4.0	0		
04	30.3	13.9	22.1	0	4.1	0		
05	25.6	8.8	17.2	0.8	0	0		
06	19.4	13.4	16.4	1.6	0	25.0		
07	32.0	11.8	21.9	0	3.9	1.5		
08	28.9	12.1	20.5	0	2.5	0		
09	30.3	12.8	21.6	0	3.6	0		
10	21.5	13.5	17.5	0.5	0	16.0		
11	18.5	8.3	13.4	4.6	0	0		
12	22.1	5.8	14.0	4.0	0	0		
13	25.7	14.9	20.3	0	2.3	0		
14	16.0	8.6	12.3	5.7	0	0		
15	21.9	4.7	13.3	4.7	0	0		
16	22.8	4.4	13.6	4.4	0	0		
17	24.3	9.5	16.9	1.1	0	0		
18	23.9	12.2	18.1	0	0.1	5.5		
19	22.9	14.2	18.6	0	0.6	4.0		
20	22.5	9.1	15.8	2.2	0	3.0		
21	24.9	6.9	15.9	2.1	0	0		
22	17.2	10.6	13.9	4.1	0	0		
23	14.2	6.6	10.4	7.6	0	0		
24	20.4	1.4	10.9	7.1	0	0		
25	27.7	5.8	16.8	1.2	0	0		
26	19.0	7.1	13.1	4.9	0	0		
27	18.1	6.9	12.5	5.5	0	0		
28	19.5	4.0	11.8	6.2	0	0		
29	26.2	2.6	14.4	3.6	0	0		
30	28.9	8.0	18.5	0	0.5	0		
31	34.1	14.2	24.2	0	6.2	0		
Sum				72.4	27.8	55.0		
Avg	24.0	9.1	16.6					
Xtrm	34.1	1.4						

Appendix 8

2008 Meteorological Data

Appendix Table 8.1. Environment Canada Daily Meteorological Data Report for Lucky Lake - 2008

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	10.9	0.4	5.7	12.3	0	1.2	2	33
02	11.7	-3.7	4	14	0	0	12	63
03	15.1	0.5	7.8	10.2	0	0	30	37
04	17.4	0.8	9.1	8.9	0	0	31	57
05	17.8	4.7	11.3	6.7	0	0	31	43
06	15.9	2	9	9	0	0	34	63
07	14.2	-1.4	6.4	11.6	0	0	34	63
08	12.1	-0.2	6	12	0	0	6	35
09	10.1	-1.7	4.2	13.8	0	0	7	43
10	15	-5.6	4.7	13.3	0	0	23	37
11	16	3	9.5	8.5	0	2.2	4	63
12	14.6	4	9.3	8.7	0	0	33	43
13	16.9	1.5	9.2	8.8	0	0	27	37
14	19.8	1.6	10.7	7.3	0	0	30	65
15	24.3	2.5	13.4	4.6	0	0	31	67
16	24.4	12.2	18.3	0	0.3	0	30	67
17	24.1	8.1	16.1	1.9	0	0	33	54
18	25.6	9.9	17.8	0.2	0	0	31	63
19	20.3	5.7	13	5	0	0	31	59
20	19.6	5.7	12.7	5.3	0	0.2	11	61
21	18.4	7.9	13.2	4.8	0	0.4	12	69
22	21.4	5.6	13.5	4.5	0	0	10	61
23	22.9	4.1	13.5	4.5	0	0	10	69
24	21.1	9.2	15.2	2.8	0	0	12	69
25	11.9	4.1	8	10	0	4.6	3	52
26	14.2	3.7	9	9	0	0.2	8	37
27	18.5	0.1	9.3	8.7	0	0	14	39
28	17.7	0.9	9.3	8.7	0	0	12	52
29	22.5	11.8	17.2	0.8	0	0	17	35
30	24.5	7	15.8	2.2	0	0	31	69
31	24.5	4.5	14.5	3.5	0	2.2	33	63
Sum				**221.6**	**0.3**	**11.0**		
Avg	**18.2**	**3.5**	**10.84**					
Xtrm	**25.6**	**-5.6**					**12**	**69**

Appendix Table 8.1 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
June 01	19.4	5.7	12.6	5.4	0	0	35	32
02	21.3	5.5	13.4	4.6	0	0.2	10	46
03	12.4	8.9	10.7	7.3	0	0.2	10	67
04	22	8.1	15.1	2.9	0	0	1	41
05	23.9	7	15.5	2.5	0	0	12	54
06	20.8	8.2	14.5	3.5	0	0.2		<31
07	13.4	8.9	11.2	6.8	0	16.4	3	48
08	13.4	8	10.7	7.3	0	3.8	1	52
09	14.4	7.1	10.8	7.2	0	0.8	14	37
10	16.9	6.7	11.8	6.2	0	0.6	10	56
11	11.1	6	8.6	9.4	0	14	8	46
12	9.2	6.5	7.9	10.1	0	23.6	35	74
13	18.8	7.6	13.2	4.8	0	0.8	28	74
14	15.7	7.3	11.5	6.5	0	0	29	57
15	18	8	13	5	0	0.2	25	106
16	23.2	6.9	15.1	2.9	0	3.4	28	72
17	26.1	8.1	17.1	0.9	0	0	12	33
18	23.4	11.4	17.4	0.6	0	0	28	67
19	21.7	9.6	15.7	2.3	0	0.4	29	46
20	23.6	6.2	14.9	3.1	0	0	34	63
21	27	11.1	19.1	0	1.1	0	7	78
22	26.6	11.3	19	0	1	1.4	16	50
23	23.4	6.8	15.1	2.9	0	0.2	14	72
24	19.4	10.1	14.8	3.2	0	9.4	1	63
25	23.6	7.8	15.7	2.3	0	0.2	33	44
26	25.8	9.3	17.6	0.4	0	M		<31
27	16.7	7.6	12.2	5.8	0	M	M	M
28	24.1	9.8	17	1	0	M	M	M
29	29.2	10.1	19.7	0	1.7	M	M	M
30	32.9	14.5	23.7	0	5.7	M	M	M
Sum				**114.9**	**9.5**	**75.8**		
Avg	**20.6**	**8.3**	**14.46**					
Xtrm	**32.9**	**5.5**					**25**	**106**

Appendix Table 8.1 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	25.5	13.9	19.7	0	1.7	M	M	M
02	21.2	8	14.6	3.4	0	M	M	M
03	27.4	9.6	18.5	0	0.5	M	M	M
04	31	13	22	0	4	M	M	M
05	26.5	M	M	M	M	M	M	M
06	23.3	10.6	17.0	1.0	0.0	M	M	M
07	19.9	11.2	15.6	2.4	0	M	34	69
08	21.9	10.3	16.1	1.9	0	M	29	46
09	23.5	10.7	17.1	0.9	0	M	8	46
10	22.4	12.1	17.3	0.7	0	M	30	72
11	19	10.8	14.9	3.1	0	M	30	69
12	21.3	9.3	15.3	2.7	0	M	31	52
13	25.6	9.1	17.4	0.6	0	M	32	70
14	22.8	10.8	16.8	1.2	0	M	29	41
15	19.4	8.4	13.9	4.1	0	M		<31
16	22.1	11.6	16.9	1.1	0	M	30	46
17	21.9	9.5	15.7	2.3	0	M		<31
18	23.5	10.7	17.1	0.9	0	M	30	44
19	21.4	8.8	15.1	2.9	0	M	33	35
20	25.6	8.9	17.3	0.7	0	M		<31
21	29.9	10.6	20.3	0	2.3	M	16	41
22	27	15.2	21.1	0	3.1	M	19	37
23	20.4	14	17.2	0.8	0	M	28	44
24	23	10.8	16.9	1.1	0	M	29	46
25	25.9	8.2	17.1	0.9	0	M		<31
26	28.7	8.8	18.8	0	0.8	M	15	37
27	27.2	11.5	19.4	0	1.4	M	26	63
28	24.5	11.1	17.8	0.2	0	M	27	61
29	26.1	11.1	18.6	0	0.6	M		<31
30	25.4	9.4	17.4	0.6	0	M	27	57
31	24	8.4	16.2	1.8	0	M	25	35
Sum				35.3	14.4	M		
Avg	24.1	10.5	17.33					
Xtrm	31.0	8.0					30	72

Appendix Table 8.1 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	33.4	5.8	19.6	0	1.6	M	23	46
02	24.2	9.9	17.1	0.9	0	M	26	43
03	23.9	7.7	15.8	2.2	0	M	28	52
04	22.6	9.5	16.1	1.9	0	M	30	46
05	27.3	8	17.7	0.3	0	M	26	44
06	25.6	8	16.8	1.2	0	M		<31
07	31	10.5	20.8	0	2.8	M	14	35
08	33.1	13.1	23.1	0	5.1	M	11	43
09	25	16.3	20.7	0	2.7	M	13	41
10	31.5	15.1	23.3	0	5.3	M	22	54
11	24.9	12	18.5	0	0.5	M	22	52
12	17.5	7.1	12.3	5.7	0	M	26	48
13	19.4	12.4	15.9	2.1	0	M	31	44
14	22	10.4	16.2	1.8	0	M		<31
15	26.7	8.3	17.5	0.5	0	M		<31
1	30.3	11.6	21	0	3	M	19	41
17	28.6	14.1	21.4	0	3.4	M	30	35
18	33.5	11.9	22.7	0	4.7	M	16	33
19	37.3	15.5	26.4	0	8.4	M	19	56
20	30	15.2	22.6	0	4.6	M	25	52
21	27.5	12.4	20	0	2	M	35	50
22	15.6	5.4	10.5	7.5	0	M	33	54
23	22	1.9	12	6	0	M		<31
24	32.1	6.8	19.5	0	1.5	M	18	44
25	36.6	17.7	27.2	0	9.2	M	19	41
26	21.6	8.6	15.1	2.9	0	M	30	69
27	17	5.6	11.3	6.7	0	M	22	41
28	21.6	5.8	13.7	4.3	0	M	22	44
29	26	4.2	15.1	2.9	0	M	15	43
30	23.7	10.7	17.2	0.8	0	M	33	39
31	11.6	7.2	9.4	8.6	0	M	1	41
Sum				**56.3**	**54.8**	**M**		
Avg	**25.9**	**10**	**17.93**					
Xtrm	**37.3**	**1.9**					**30**	**69**

Appendix Table 8.2. Environment Canada Daily Meteorological Data Report for Outlook PFRA - 2008

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	12.7	1.3	7	11	0	3.2	6	35
02	13.6	-2.2	5.7	12.3	0	0		<31
03	16.4	3.9	10.2	7.8	0	0		<31
04	18.2	0.7	9.5	8.5	0	0	28	52
05	17.9	4	11	7	0	0	35	37
06	16.1	3.4	9.8	8.2	0	0.4	2	35
07	13.5	-0.5	6.5	11.5	0	0	5	32
08	13.1	-2.3	5.4	12.6	0	0	6	32
09	10	-0.5	4.8	13.2	0	0	4	35
10	15.2	-5.2	5	13	0	0	24	33
11	17.2	2.8	10	8	0	0	7	41
12	15.6	3.3	9.5	8.5	0	0	31	33
13	17.7	2.3	10	8	0	0		<31
14	19.7	1.8	10.8	7.2	0	0	34	54
15	24.5	4.4	14.5	3.5	0	0	31	52
16	24.1	12.3	18.2	0	0.2	0	32	59
17	23.9	7.3	15.6	2.4	0	0	35	37
18	24.6	5.5	15.1	2.9	0	0	31	48
19	19.7	6.5	13.1	4.9	0	0	36	46
20	18.3	3.5	10.9	7.1	0	0	13	52
21	19.7	10.4	15.1	2.9	0	0	13	67
22	20.9	5.8	13.4	4.6	0	0	12	50
23	23.1	4.9	14	4	0	0	7	61
24	22.9	10.4	16.7	1.3	0	0	17	54
25	11.7	6	8.9	9.1	0	1.8	3	46
26	15.7	3.1	9.4	8.6	0	0		<31
27	19.1	-1.1	9	9	0	0	17	39
28	19.8	-0.7	9.6	8.4	0	0	14	48
29	23.6	12.2	17.9	0.1	0	0	13	37
30	24	7.4	15.7	2.3	0	0	31	57
31	24.9	5.8	15.4	2.6	0	0.4	31	50
Sum				**210.5**	**0.2**	**5.8**		
Avg	**18.6**	**3.8**	**11.19**					
Xtrm	**24.9**	**-5.2**					13	67

Appendix Table 8.2 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
June 01	18.8	6.7	12.8	5.2	0	0	2	33
02	21.5	3.6	12.6	5.4	0	0	13	35
03	16.9	7.3	12.1	5.9	0	0	10	59
04	23.7	1.6	12.7	5.3	0	0	3	33
05	25.6	6.9	16.3	1.7	0	0	18	44
06	21.5	7.3	14.4	3.6	0	0	26	35
07	15.2	9.8	12.5	5.5	0	8	6	39
08	15.2	9.2	12.2	5.8	0	6.6	4	43
09	16	8	12	6	0	0		<31
10	18.5	6.1	12.3	5.7	0	0	11	44
11	14.7	7.8	11.3	6.7	0	4	10	56
12	11.7	7.8	9.8	8.2	0	10.4	1	70
13	20.2	8.7	14.5	3.5	0	0.2	1	33
14	17.1	8.1	12.6	5.4	0	4.8	30	46
15	18.4	9.4	13.9	4.1	0	0		<31
16	23.9	6.9	15.4	2.6	0	0.4	17	39
17	26.9	9.4	18.2	0	0.2	0.4	18	32
18	23.3	12	17.7	0.3	0	0	29	52
19	22	10.5	16.3	1.7	0	0	29	44
20	24.2	7.8	16	2	0	0		<31
21	27.4	9.7	18.6	0	0.6	0.2		<31
22	27.9	10.9	19.4	0	1.4	2.6	17	46
23	23.6	9.5	16.6	1.4	0	0.2		<31
24	19.9	9.5	14.7	3.3	0	0.2	26	32
25	23.9	10.5	17.2	0.8	0	0.2	26	43
26	26.5	10.4	18.5	0	0.5	2.6	32	52
27	17.9	8.3	13.1	4.9	0	3.2	29	56
28	24.7	9.9	17.3	0.7	0	0		<31
29	29.8	9.2	19.5	0	1.5	0	18	33
30	33.5	13.8	23.7	0	5.7	0	1	43
Sum				**95.7**	**9.9**	**44.0**		
Avg	**21.7**	**8.6**	**15.12**					
Xtrm	**33.5**	**1.6**					**1**	**70**

Appendix Table 8.2 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	25.2	14.3	19.8	0	1.8	2.2	2	39
02	22.3	8.3	15.3	2.7	0	0.2		<31
03	27.5	9.7	18.6	0	0.6	0		<31
04	32.3	13.5	22.9	0	4.9	0	22	35
05	26.6	17.3	22	0	4	4.6	20	59
06	22.6	10.8	16.7	1.3	0	4.6	9	56
07	19.4	12.2	15.8	2.2	0	18.8	3	35
08	22.4	11.4	16.9	1.1	0	0.2	30	48
09	23.8	11.7	17.8	0.2	0	0.6	4	37
10	21.4	12.2	16.8	1.2	0	3.8	36	37
11	20.1	11.7	15.9	2.1	0	0	31	56
12	22.9	10.5	16.7	1.3	0	0	30	44
13	25.8	11.4	18.6	0	0.6	0	29	37
14	24.3	12	18.2	0	0.2	0	33	48
15	21.4	8.9	15.2	2.8	0	0		<31
16	23.3	12.5	17.9	0.1	0	7	26	43
17	23.5	9.9	16.7	1.3	0	0.2		<31
18	24.6	10.6	17.6	0.4	0	0	14	56
19	23.7	9.4	16.6	1.4	0	0	27	35
20	27	9.5	18.3	0	0.3	0		<31
21	32.1	11	21.6	0	3.6	0	17	44
22	26.9	16.7	21.8	0	3.8	0	15	41
23	23.3	17.3	20.3	0	2.3	0	28	35
24	24.4	11.9	18.2	0	0.2	0	28	35
25	27.3	10.9	19.1	0	1.1	0		<31
26	29.8	9.4	19.6	0	1.6	0	13	33
27	26.9	13.5	20.2	0	2.2	0.2	29	59
28	24.7	11	17.9	0.1	0	0.8	30	44
29	26.5	11.7	19.1	0	1.1	0		<31
30	28.2	14.3	21.3	0	3.3	0	26	63
31	25.1	9.5	17.3	0.7	0	0	26	43
Sum				**18.9**	**31.6**	**43.2**		
Avg	**25**	**11.8**	**18.39**					
Xtrm	**32.3**	**8.3**					**26**	**63**

Appendix Table 8.2 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	34.8	7.6	21.2	0	3.2	0	21	57
02	24.1	10.4	17.3	0.7	0	0	30	35
03	24.2	9.7	17	1	0	0	29	54
04	21.1	11.8	16.5	1.5	0	2.8	26	35
05	27	10.5	18.8	0	0.8	0	31	37
06	25.9	9.9	17.9	0.1	0	0		<31
07	29.6	9.8	19.7	0	1.7	0	15	37
08	32.6	13.5	23.1	0	5.1	0	1	43
09	25.6	18.4	22	0	4	1.4	14	46
10	32.1	17.4	24.8	0	6.8	0	25	50
11	25.7	14.8	20.3	0	2.3	2	30	50
12	18.5	9.8	14.2	3.8	0	7.8	25	44
13	20.3	12.6	16.5	1.5	0	9.8	30	39
14	22.4	12.6	17.5	0.5	0	0.2		<31
15	27.3	10.1	18.7	0	0.7	0		<31
16	29.8	13.2	21.5	0	3.5	0	20	37
17	27.5	15.4	21.5	0	3.5	0		<31
18	33	12.2	22.6	0	4.6	0	16	41
19	37.6	15.8	26.7	0	8.7	0	18	50
20	30	16.3	23.2	0	5.2	0	25	56
21	25.6	12.7	19.2	0	1.2	9	31	57
22	16.2	7.8	12	6	0	0.2	35	48
23	21.5	3.1	12.3	5.7	0	0		<31
24	31.1	9	20.1	0	2.1	0	17	37
25	35.7	16.5	26.1	0	8.1	0	15	41
26	20.6	9.4	15	3	0	9	29	54
27	18.1	8	13.1	4.9	0	0	26	43
28	21.4	7.8	14.6	3.4	0	0.2	26	41
29	25	8	16.5	1.5	0	0	18	35
30	22.3	11.2	16.8	1.2	0	0	34	32
31	11.5	6.8	9.2	8.8	0	1.4		<31
Sum				43.6	61.5	43.8		
Avg	25.7	11.4	18.55					
Xtrm	37.6	3.1					21	57

Appendix Table 8.3. Environment Canada Daily Meteorological Data Report for Saskatoon - 2008

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	14	-2.1	6	12	0	0.5	9	39
02	14.7	-4.9	4.9	13.1	0	0	36	35
03	17.2	-3.7	6.8	11.2	0	0	1	33
04	16.4	-1.7	7.4	10.6	0	0		<31
05	18.3	-0.3	9	9	0	0	33	48
06	15.8	1.7	8.8	9.2	0	0.5	2	41
07	12.8	-2.4	5.2	12.8	0	0		<31
08	13.1	-2.9	5.1	12.9	0	0	6	32
09	9.9	-2.1	3.9	14.1	0	0	5	33
10	16.3	-3.4	6.5	11.5	0	0	26	32
11	17.3	5	11.2	6.8	0	0	10	46
12	16.3	0.3	8.3	9.7	0	0.5	7	35
13	18.5	0.2	9.4	8.6	0	0	26	33
14	20.1	2.4	11.3	6.7	0	0	32	46
15	25.2	2.5	13.9	4.1	0	0	29	56
16	24.7	7.8	16.3	1.7	0	0	34	61
17	22.9	4.7	13.8	4.2	0	0	34	44
18	24.4	8.9	16.7	1.3	0	0	18	41
19	15.7	5.3	10.5	7.5	0	0	36	39
20	17.3	3.4	10.4	7.6	0	0	13	50
21	20.4	10.3	15.4	2.6	0	0	14	59
22	20.9	6.4	13.7	4.3	0	0	11	54
23	22.5	4.1	13.3	4.7	0	0	10	54
24	23	10.4	16.7	1.3	0	0	10	61
25	12	7.7	9.9	8.1	0	1	6	50
26	16.3	-1.5	7.4	10.6	0	0		<31
27	20.4	1.6	11	7	0	0	21	33
28	20.9	1.5	11.2	6.8	0	0	16	41
29	24.8	13.1	19	0	1	0	18	35
30	24.5	7.5	16	2	0	2.5	29	54
31	24.3	2.9	13.6	4.4	0	0	25	50
Sum				226.4	1	5.0		
Avg	18.7	2.7	10.7					
Xtrm	25.2	-4.9					34	61

Appendix Table 8.3 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
June 01	18.7	2.5	10.6	7.4	0	0	4	32
02	20.4	5.9	13.2	4.8	0	0	16	33
03	20.5	6.9	13.7	4.3	0	0	15	41
04	24	2.3	13.2	4.8	0	2.5	3	33
05	25.6	4.2	14.9	3.1	0	0.5	16	37
06	22.6	9.7	16.2	1.8	0	0	15	33
07	16.3	9.8	13.1	4.9	0	2.5	7	57
08	17.7	7.1	12.4	5.6	0	2.5	3	46
09	16.9	1.6	9.3	8.7	0	0		<31
10	19.8	8.4	14.1	3.9	0	0	10	48
11	18.3	5.5	11.9	6.1	0	2.5	10	63
12	13.8	8.2	11	7	0	6	2	72
13	20.9	8.1	14.5	3.5	0	0	36	46
14	20.2	4.3	12.3	5.7	0	11	34	46
15	19.8	4.7	12.3	5.7	0	1		<31
16	22.6	5.3	14	4	0	1.5	1	41
17	26.9	8.2	17.6	0.4	0	0	2	33
18	22.6	10.6	16.6	1.4	0	0	30	50
19	22.8	8.1	15.5	2.5	0	1	33	54
20	24.7	6.1	15.4	2.6	0	0	31	35
21	28.2	8	18.1	0	0.1	0		<31
22	28.5	13	20.8	0	2.8	2.5	16	50
23	25.3	8.2	16.8	1.2	0	0.5	27	39
24	22.4	10.6	16.5	1.5	0	1		<31
25	25.5	7.1	16.3	1.7	0	0.5	30	44
26	25.1	8.2	16.7	1.3	0	23	30	70
27	17	9.2	13.1	4.9	0	6.5	35	56
28	25.1	8.2	16.7	1.3	0	0.5		<31
29	29.3	11.8	20.6	0	2.6	0		<31
30	33.3	11.7	22.5	0.0	4.5	0	22	56
Sum				**100.1**	**10.0**	**65.5**		
Avg	**22.5**	**7.0**	**14.97**					
Xtrm	**33.3**	**1.6**					**2**	**72**

Appendix Table 8.3 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	24.7	10.4	17.6	0.4	0	0	3	46
02	22.2	6.9	14.6	3.4	0	0	28	50
03	27.5	9.7	18.6	0	0.6	0		<31
04	32.1	15	23.6	0	5.6	0	21	37
05	26.6	14.1	20.4	0	2.4	0.5	20	70
06	18.8	8.1	13.5	4.5	0	5		<31
07	18.3	10.3	14.3	3.7	0	10		<31
08	21.9	9.5	15.7	2.3	0	2	30	56
09	23.7	7.6	15.7	2.3	0	0.5		<31
10	22.2	10.5	16.4	1.6	0	6	34	32
11	20.7	10.7	15.7	2.3	0	1.5	29	65
12	22.9	11.4	17.2	0.8	0	0	32	48
13	26.8	9.7	18.3	0	0.3	0.5		<31
14	24.4	9.1	16.8	1.2	0	1.5		<31
15	22.3	6	14.2	3.8	0	0		<31
16	24.3	10.7	17.5	0.5	0	0	32	48
17	24.5	9.4	17	1	0	0.5		<31
18	24.3	11.9	18.1	0	0.1	2	13	39
19	23.5	9.8	16.7	1.3	0	51.0	24	57
20	25.5	8.6	17.1	0.9	0	1.5		<31
21	30.5	12.8	21.7	0	3.7	1	15	46
22	27.4	16.8	22.1	0	4.1	0	17	35
23	24.5	17.4	21	0	3	2	36	39
24	24.8	10.9	17.9	0.1	0	0		<31
25	27.3	8.7	18	0	0	0	31	35
26	28.5	11.5	20	0	2	0	16	32
27	26.2	14.9	20.6	0	2.6	5.5	3	63
28	23.6	11.6	17.6	0.4	0	2	25	46
29	24.4	12.5	18.5	0	0.5	0		<31
30	27.5	12.7	20.1	0	2.1	0	28	63
31	22.8	9	15.9	2.1	0	0	26	56
Sum				32.6	27	93.0		
Avg	24.7	10.9	17.79					
Xtrm	32.1	6.0					20	70

Appendix Table 8.3 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	31.6	8.9	20.3	0	2.3	0	13	39
02	23.3	10.1	16.7	1.3	0	0	26	46
03	22.1	8.3	15.2	2.8	0	0	28	52
04	22.9	9.6	16.3	1.7	0	0	33	39
05	25.7	8.4	17.1	0.9	0	0.5	27	41
06	25.3	8.1	16.7	1.3	0	0		<31
07	29.2	11.4	20.3	0	2.3	0		<31
08	31.7	15.3	23.5	0	5.5	1.5	2	44
09	26.3	18.3	22.3	0	4.3	1.5	18	57
10	30.9	16.1	23.5	0	5.5	0.5	23	35
11	24.9	14.3	19.6	0	1.6	0	30	32
12	19.7	9.2	14.5	3.5	0	0	24	37
13	20.8	9.4	15.1	2.9	0	1	33	35
14	23.4	11.7	17.6	0.4	0	0.5		<31
15	28.2	9.4	18.8	0	0.8	0	23	32
16	30	12.5	21.3	0	3.3	0.5	22	37
17	27.2	15.3	21.3	0	3.3	0	2	39
18	32.4	14.3	23.4	0	5.4	0	19	41
19	36.8	17.7	27.3	0	9.3	0	18	52
20	30	16	23	0	5	0	22	50
21	22.4	10.8	16.6	1.4	0	0	1	46
22	15.3	4.4	9.9	8.1	0	0	34	52
23	21.6	2	11.8	6.2	0	0		<31
24	30.6	8.8	19.7	0	1.7	0.5	2	39
25	35.2	17.4	26.3	0	8.3	0.5	18	52
26	21.8	8.4	15.1	2.9	0	12.5	4	56
27	18.9	4.1	11.5	6.5	0	0	27	39
28	22	4.8	13.4	4.6	0	0	29	54
29	23.8	4.1	14	4	0	0	25	33
30	21.6	5.9	13.8	4.2	0	0	32	41
31	12.5	1.7	7.1	10.9	0	0		<31
Sum				**63.6**	**58.6**	**19.5**		
Avg	**25.4**	**10.2**	**17.82**					
Xtrm	**36.8**	**1.7**					**18**	**57**

Appendix Table 8.4. Environment Canada Daily Meteorological Data Report for Regina - 2008

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	14.6	2	8.3	9.7	0	0	9	48
02	12.9	-8.4	2.3	15.7	0	0	33	54
03	17.2	-6.8	5.2	12.8	0	0	35	52
04	17.6	-5.2	6.2	11.8	0	0	34	48
05	20	1.8	10.9	7.1	0	0	29	61
06	18.8	4.4	11.6	6.4	0	0	2	41
07	15.2	-4.8	5.2	12.8	0	0	2	44
08	13.9	-1.3	6.3	11.7	0	0	7	37
09	9.5	-1.3	4.1	13.9	0	0	7	33
10	14.4	-8.5	3	15	0	0	28	46
11	17.5	-1	8.3	9.7	0	0	19	63
12	14.2	1.3	7.8	10.2	0	0.5	5	52
13	16.7	-5	5.9	12.1	0	0.5	27	57
14	21.5	0.6	11.1	6.9	0	0	30	72
15	23.6	-1.5	11.1	6.9	0	0.5	31	59
16	25.8	6.7	16.3	1.7	0	0	33	72
17	23.3	1.1	12.2	5.8	0	0	32	80
18	25.2	4.1	14.7	3.3	0	0	14	52
19	17	3.4	10.2	7.8	0	0	33	57
20	18.9	-1.4	8.8	9.2	0	0	1	54
21	20.7	8.5	14.6	3.4	0	0	13	69
22	21.3	5.5	13.4	4.6	0	0	10	61
23	23.8	6.4	15.1	2.9	0	1	11	70
24	20.9	10.5	15.7	2.3	0	8.5	12	72
25	11.8	3.9	7.9	10.1	0	20.5	4	61
26	14.6	-0.3	7.2	10.8	0	0.5	1	32
27	18.8	-1.1	8.9	9.1	0	0	18	37
28	19.4	-0.1	9.7	8.3	0	0	14	57
29	18.8	7.7	13.3	4.7	0	M	16	37
30	25.8	4.5	15.2	2.8	0	0.5	32	72
31	24.3	6.5	15.4	2.6	0.0	0	34	59
Sum				252.1	0.0	32.5		
Avg	18.6	1.0	9.84					
Xtrm	25.8	-8.5					32	80

Appendix Table 8.4 (continued)								
Month/Day	**Max Temp °C**	**Min Temp °C**	**Mean Temp °C**	**Heat Deg Days °C**	**Cool Deg Days °C**	**Total Precip mm**	**Dir of Max Gust 10's Deg**	**Spd of Max Gust km/h**
June 01	21	4.4	12.7	5.3	0	0	36	41
02	23.2	5.5	14.4	3.6	0	0.5	15	46
03	13.8	8.1	11	7	0	0	12	61
04	20.7	5.8	13.3	4.7	0	0	7	35
05	22.6	3.3	13	5	0	0	12	54
06	22.4	7.2	14.8	3.2	0	0	5	37
07	13.8	9.3	11.6	6.4	0	4	27	39
08	16.3	8.6	12.5	5.5	0	1.5	4	44
09	17	9	13	5	0	2		<31
10	17.3	8.1	12.7	5.3	0	0	13	52
11	12.2	5.7	9	9	0	22	10	69
12	13.9	7.8	10.9	7.1	0	20	6	41
13	16.6	8.2	12.4	5.6	0	2	31	65
14	18.3	7.5	12.9	5.1	0	1	28	54
15	18.9	7.7	13.3	4.7	0	0		<31
16	23.9	5.2	14.6	3.4	0	0	25	44
17	28.1	9.6	18.9	0	0.9	3	16	44
18	25.3	13.3	19.3	0	1.3	0	27	96
19	24.9	8.5	16.7	1.3	0	0	30	52
20	23.6	5	14.3	3.7	0	0	34	44
21	26.2	7.9	17.1	0.9	0	0	32	32
22	28	9.3	18.7	0	0.7	1	17	48
23	23.6	12.8	18.2	0	0.2	3	1	48
24	22.9	10.2	16.6	1.4	0	3.5	34	54
25	25.2	6.9	16.1	1.9	0	1	27	37
26	27.1	11.3	19.2	0	1.2	0.5	25	48
27	17.7	8.5	13.1	4.9	0	8	28	56
28	24.2	9.9	17.1	0.9	0	0	35	39
29	27.8	9	18.4	0	0.4	0	22	33
30	32	11.4	21.7	0	3.7	0	21	32
Sum				**100.9**	**8.4**	**73.0**		
Avg	**21.6**	**8.2**	**14.89**					
Xtrm	**32.0**	**3.3**					**27**	**96**

Appendix Table 8.4 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	27.5	15.3	21.4	0	3.4	0	36	54
02	21.6	10.3	16	2	0	0		<31
03	26.8	9.6	18.2	0	0.2	0		<31
04	32.4	12.3	22.4	0	4.4	0	21	35
05	27.9	14	21	0	3	0.5	30	70
06	26.2	11.5	18.9	0	0.9	0	10	46
07	19.9	7.3	13.6	4.4	0	0.5	32	57
08	23.3	5.3	14.3	3.7	0	0	31	57
09	26.4	7.1	16.8	1.2	0	2	7	32
10	29.6	12.6	21.1	0	3.1	2	14	48
11	17.6	11.4	14.5	3.5	0	18.5	34	70
12	22.3	8.4	15.4	2.6	0	1	31	63
13	26.5	7.1	16.8	1.2	0	0.5	3	69
14	24.2	10.7	17.5	0.5	0	8.5	25	50
15	21.9	9	15.5	2.5	0	2.5		<31
16	23.1	13.4	18.3	0	0.3	3.5		<31
17	23.3	12.5	17.9	0.1	0	1		<31
18	25.1	9.2	17.2	0.8	0	0	12	37
19	21.8	12.2	17	1	0	7.5	27	52
20	25.4	9.1	17.3	0.7	0	0.5		<31
21	28.4	12	20.2	0	2.2	0	14	44
22	31.5	16.5	24	0	6	20	21	95
23	24.6	17.9	21.3	0	3.3	16.5	29	44
24	24.7	11.5	18.1	0	0.1	0	31	39
25	25.9	8	17	1	0	0		<31
26	26.5	10.1	18.3	0	0.3	0		<31
27	28.5	14.4	21.5	0.0	3.5	14.5	15	50
28	26.5	12.9	19.7	0	1.7	0	31	91
29	25.1	9.9	17.5	0.5	0	0.5	31	37
30	27	12.7	19.9	0	1.9	16.5	25	59
31	24.3	8	16.2	1.8	0	1	26	35
Sum				27.5	34.3	117.5		
Avg	25.3	11.0	18.19					
Xtrm	32.4	5.3					21	95

Appendix Table 8.4 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	31.4	8.7	20.1	0	2.1	0.5	16	41
02	25.9	14.9	20.4	0	2.4	0	28	33
03	24.6	10.1	17.4	0.6	0	0	30	56
04	24.3	8.2	16.3	1.7	0	0	30	44
05	27.5	6.4	17	1	0	0	3	63
06	25.8	7.5	16.7	1.3	0	0		<31
07	27.9	8.9	18.4	0	0.4	0	12	37
08	29.6	15.9	22.8	0	4.8	0	11	35
09	24.4	16.7	20.6	0	2.6	0	10	41
10	29.2	16.7	23	0	5	23	9	85
11	24.4	10	17.2	0.8	0	0	25	32
12	21.4	6.5	14	4	0	0	27	50
13	20.2	11.6	15.9	2.1	0	3	33	50
14	21.9	11.8	16.9	1.1	0	1.5		<31
15	26.2	7.2	16.7	1.3	0	0.5		<31
16	28.7	10.1	19.4	0	1.4	0	19	33
17	28.9	10.2	19.6	0	1.6	0	36	39
18	28.7	13.9	21.3	0	3.3	0	14	39
19	33.8	15.3	24.6	0	6.6	1	16	57
20	30.1	13.9	22	0	4	0	14	33
21	28.1	13.5	20.8	0	2.8	0	30	37
22	16.2	4.4	10.3	7.7	0	18.5	34	65
23	20.4	2.1	11.3	6.7	0	0.5		<31
24	27.5	9.1	18.3	0.0	0.3	0	15	50
25	33.8	12.8	23.3	0	5.3	1	17	54
26	23.2	8.9	16.1	1.9	0	0.5	29	74
27	17.9	5.7	11.8	6.2	0	0.5	22	65
28	22.2	3.9	13.1	4.9	0	0	27	39
29	24.2	3.7	14	4	0	0.5	13	39
30	29.9	10.2	20.1	0	2.1	0.5	36	46
31	16.3	9.2	12.8	5.2	0	2	3	46
Sum				**50.5**	**44.7**	**53.5**		
Avg	**25.6**	**9.9**	**17.78**					
Xtrm	**33.8**	**2.1**					**9**	**85**

Appendix 9

2009 Meteorological Data

Appendix Table 9.1. Environment Canada Daily Meteorological Data Report for Lucky Lake - 2009

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	14.5	-1.3	6.6	11.4	0	M	30	56
02	14.4	0.7	7.6	10.4	0	M	31	44
03	20.5	-1.7	9.4	8.6	0	M	18	44
04	19.2	2.8	11.0	7.0	0	0	28	46
05	21.5	0.3	10.9	7.1	0	0	24	72
06	14.3	-1.1	6.6	11.4	0	0	32	70
07	12.1	-4.3	3.9	14.1	0	0		
08	6.7	-5.7	0.5	17.5	0	0	2	37
09	14.2	-8.5	2.9	15.1	0	0		
10	17.3	-3.2	7.1	10.9	0	0	21	35
11	20.3	1.3	10.8	7.2	0	0	21	46
12	21.1	5.0	13.1	4.9	0	0	19	61
13	9.1	-2.1	3.5	14.5	0	1.4	32	69
14	10.8	-1.0	4.9	13.1	0	8	14	54
15	9.1	-0.8	4.2	13.8	0	0	36	35
16	18.3	1.1	9.7	8.3	0	0	19	35
17	22.7	6.8	14.8	3.2	0	0	1	61
18	10.3	0.1	5.2	12.8	0	0	1	54
19	18.3	1.6	10.0	8.0	0	1.2	6	63
20	9.1	-1.1	4.0	14.0	0	0	28	56
21	16.0	-2.0	7.0	11.0	0	0	26	44
22	12.6	-0.1	6.3	11.7	0	0	31	41
23	21.6	-0.3	10.7	7.3	0	0	10	33
24	20.3	6.9	13.6	4.4	0	0.2	17	44
25	19.4	6.1	12.8	5.2	0	0.2	2	43
26	23.8	1.6	12.7	5.3	0	0.6	16	61
27	22.5	10.9	16.7	1.3	0	0	28	65
28	22.0	5.1	13.6	4.4	0	0.2	30	56
29	22.3	38	13.1	4.9	0	0	30	54
30	32.9	5.1	19.0	0.0	1	0	33	67
31	22.5	6.7	14.6	3.4	0	0	31	52
Sum				**272.2**	**1**	**11.8**		
Avg	**17.4**	**1.1**	**9.23**					
Xtrm	**32.9**	**-8.5**					**24**	**72**

Appendix Table 9.1 (continued)								
Month/Day	**Max Temp °C**	**Min Temp °C**	**Mean Temp °C**	**Heat Deg Days °C**	**Cool Deg Days °C**	**Total Precip mm**	**Dir of Max Gust 10's Deg**	**Spd of Max Gust km/h**
June 01	14.3	2.1	8.2	9.8	0	0	33	57
02	20.1	-1.6	9.3	8.7	0	0		
03	25.1	3.4	14.3	3.7	0	0	30	54
04	18.2	1.7	10.0	8.0	0	0	34	65
05	9.8	-1.2	4.3	13.7	0	0	10	33
06	6.8	3.7	5.3	12.7	0	9.6	5	44
07	9.8	3.7	6.8	11.2	0	5.4	9	37
08	10.8	3.5	7.2	10.8	0	7.4	8	39
09	12.8	-0.6	6.1	11.9	0	0.2	35	33
10	14.4	4.5	9.5	8.5	0	16		
11	22.7	3.5	13.1	4.9	0	0	24	43
12	23.1	11.3	17.2	0.8	0	0	24	32
13	26.9	7.7	17.3	0.7	0	0	16	41
14	29.7	11.6	20.7	0	2.7	0	16	52
15	28.8	11.0	19.9	0	1.9	0	9	39
16	28.6	11.2	19.9	0	1.9	0	13	33
17	28.3	13.3	20.8	0	28	0	27	50
18	24.7	11.0	17.9	0.1	0	0.2	28	44
19	25.5	9.8	17.7	0.3	0	0	30	41
20	27.3	14.2	20.8	0	28	0	14	44
21	23.0	12.7	17.9	0.1	0	7.2	26	52
22	21.2	10.5	15.9	2.1	0	10.6	25	54
23	22.0	9.2	15.6	2.4	0	15.0	26	57
24	24.3	8.2	16.3	1.7	0	0	31	50
25	32.2	11.1	21.7	0	3.7	0	27	59
26	26.2	7.9	17.1	0.9	0	0	24	39
27	19.6	9.0	14.3	3.7	0	0.4	28	74
28	30.0	6.7	18.4	0	04	0	27	59
29	21.7	10.3	16.0	2.0	0	0	2	52
30	29.2	10.9	20.1	0	2.1	0	31	50
Sum				**118.7**	**18.3**	**57.6**		
Avg	**21.9**	**7.3**	**14.6**					
Xtrm	**32.2**	**-1.6**					**28**	**74**

Appendix Table 9.1 (continued)								
Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	22.0	9.5	15.8	2.2	0	0	34	43
02	23.7	5.6	14.7	3.3	0	0		
03	21.6	11.1	16.4	1.6	0	8.6	11	46
04	22.1	8.4	15.3	2.7	0	0.2		
05	20.7	12.4	16.6	1.4	0	5.4	13	33
06	20.4	9.8	15.1	2.9	0	0.8	10	43
07	24.6	13.0	18.8	0	0.8	12.6	10	41
08	19.1	12.0	15.6	2.4	0	2.6	23	43
09	17.5	9.7	13.6	4.4	0	1.0	31	59
10	17.4	7.9	12.7	5.3	0	0.4	31	37
11	24.6	6.4	15.5	2.5	0	0	30	43
12	20.5	5.2	12.9	5.1	0	0	12	37
13	23.8	14.6	19.2	0	1.2	27.4	5	80
14	15.6	7.7	11.7	6.3	0	3.2	30	63
15	18.1	5.8	12.0	6.0	0	0	29	39
16	20.9	6.1	13.5	4.5	0	0		
17	24.6	7.9	16.3	1.7	0	0	1	32
18	30.2	12.3	21.3	0	3.3	0	17	50
19	25.1	13.3	19.2	0	1.2	0	17	52
20	22.0	10.0	16.0	2.0	0	0	31	63
21	24.5	11.2	17.9	0.1	0	0	31	43
22	30.1	10.8	20.5	0	2.5	0	28	32
23	26.9	12.2	19.6	0	1.6	0	28	46
24	28.5	10.4	19.5	0	1.5	0	5	32
25	31.6	11.0	21.3	0	3.3	0	33	48
26	25.3	10.8	18.1	0	0.1	2.6	35	52
27	23.2	9.0	16.1	1.9	0	0.2	33	46
28	21.9	9.1	15.5	2.5	0	5.4		
29	19.2	6.9	13.1	4.9	0	0	1	39
30	23.8	5.3	14.6	3.4	0	1.0	25	39
31	19.2	7.1	13.2	4.8	0	0	36	41
Sum				**71.9**	**15.5**	**71.4**		
Avg	**22.9**	**9.4**	**16.2**					
Xtrm	**31.6**	**5.2**					**5**	**80**

Appendix Table 9.1 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	28.5	6.1	17.3	0.7	0	0	28	39
02	25.3	12.3	18.8	0	0.8	0.2	30	43
03	17.8	6.3	12.1	5.9	0	0	33	41
04	17.7	5.0	11.4	6.6	0	0		
05	21.6	6.0	13.8	4.2	0	0		
06	20.7	8.5	14.6	3.4	0	14.8	9	43
07	148	10.2	12.5	5.5	0	14.0		
08	21.8	7.6	14.7	3.3	0	0.2		
09	25.8	8.2	17.0	1.0	0	0		
10	30.1	11.7	20.9	0	2.9	0	22	33
11	31.5	12.8	22.2	0	4.2	0	25	54
12	26.2	11.1	18.7	0	0.7	0	21	32
13	20.3	10.4	15.4	2.6	0	0.4	1	33
14	19.0	8.5	138	4.2	0	0.4	2	32
15	20.7	12.0	16.4	1.6	0	4.6	26	35
1	13.1	7.5	10.3	7.7	0	14.6	34	46
17	22.6	7.9	15.3	2.7	0	02	29	44
18	22.5	10.2	16.4	1.6	0	0.6	25	39
19	20.0	10.9	15.5	2.5	0	0	31	57
20	21.8	9.3	15.6	2.4	0	0	33	35
21	24.5	7.2	15.9	2.1	0	0	12	48
22	26.9	11.5	19.2	0	1.2	0	27	52
23	25.2	8.3	16.8	1.2	0	0	3	44
24	22.5	9.1	15.8	2.2	0	0	32	41
25	30.4	5.4	17.9	0.1	0	0	15	33
26	30.0	11.3	20.7	0	2.7	0	26	39
27	17.1	7.9	12.5	5.5	0	0.2		
28	25.1	6.9	16.0	2.0	0	0.2		
29	25.5	7.7	16.6	1.4	0	0		
30	25.6	7.3	16.5	1.5	0	0	16	32
31	29.1	7.2	18.2	0	0.2	0	15	39
Sum				**71.9**	**12.7**	**50.4**		
Avg	**23.3**	**8.8**	**16.1**					
Xtrm	**31.5**	**5.0**					**31**	

Appendix Table 9.2. Environment Canada Daily Meteorological Data Report for Outlook PFRA - 2009

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	14.8	0.2	7.5	10.5	0	0	31	48
02	14.5	2.3	8.4	9.6	0	0	1	35
03	21.7	-2.5	9.6	8.4	0	0	19	39
04	21.1	4.9	13.0	5.0	0	0	28	44
05	22.6	-0.4	11.1	6.9	0	0	25	56
06	12.3	0.5	6.4	11.6	0	M		
07	11.4	-4.6	3.4	14.6	0	0	7	33
08	6.1	-3.4	1.4	16.6	0	M		
09	13.8	-6.6	3.6	14.4	0	0.3		
10	18.3	-1.6	8.4	9.6	0	0		
11	21.0	-0.2	10.4	7.6	0	0	22	43
12	21.9	7.3	14.6	3.4	0	0	2	76
13	10.3	-1.9	4.2	13.8	0	5.5	36	61
14	10.3	-1.6	4.4	13.6	0	M		
15	9.6	-1.1	4.3	13.7	0	0		
16	19.0	0.0	9.5	8.5	0	0	15	35
17	22.9	5.6	14.3	3.7	0	0	2	57
18	10.0	0.5	5.3	12.7	0	0	1	46
19	15.0	3.2	9.1	8.9	0	0	14	69
20	7.2	0.1	3.7	14.3	0	0	31	44
21	17.8	1.0	9.4	8.6	0	0	25	46
22	12.8	-0.6	6.1	11.9	0	0		
23	21.0	-0.4	10.3	7.7	0	0	18	39
24	19.1	7.6	13.4	4.6	0	0	8	37
25	20.1	6.4	13.3	4.7	0	0	35	50
26	23.9	2.7	13.3	4.7	0	0	20	69
27	22.7	101	16.4	1.6	0	0	31	59
28	21.9	4.6	13.3	4.7	0	0	30	54
29	21.8	8.0	14.9	3.1	0	0	34	50
30	31.8	4.0	17.9	0.1	0	0	1	57
31	22.7	8.6	15.7	2.3	0	0.3	31	50
Sum				**261.4**	**0**	**6.1**		
Avg	**17.4**	**1.7**	**9.55**					
Xtrm	**31.8**	**-6.6**					**2**	**76**

Appendix Table 9.2 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
June 01	15.3	6.1	10.7	7.3	0	0	31	43
02	20.7	0.7	10.7	7.3	0	0		
03	25.5	5.1	15.3	2.7	0	0	26	52
04	17.4	4.9	11.2	6.8	0	0.5	1	48
05	11.0	1.2	6.1	11.9	0	0		
06	7.6	5.1	6.4	11.6	0	0.6	9	35
07	10.3	4.3	7.3	10.7	0	4.9	11	35
08	12.8	4.7	8.8	9.2	0	5.1	7	43
09	12.4	2.7	7.6	10.4	0	0.4		
10	17.1	4.5	10.8	7.2	0	0	30	32
11	23.8	4.2	14.0	4.0	0	0	26	61
12	23.4	11.2	17.3	0.7	0	04	1	32
13	27.3	6.1	16.7	1.3	0	0	20	33
14	31.3	12.3	21.8	0	3.8	0	17	44
15	29.4	14.0	21.7	0	3.7	0		
16	29.5	9.9	19.7	0	1.7	0	15	33
17	28.1	13.2	20.7	0	2.7	0	25	41
18	25.0	11.6	18.3	0	0.3	0.3	30	37
19	25.4	10.3	17.9	0.1	0	0	36	41
20	28.2	14.4	21.3	0	3.3	0	21	43
21	20.8	14.2	17.5	0.5	0	18.6	27	44
22	20.5	12.5	16.5	1.5	0	5.4	23	50
23	23.6	11.6	17.6	0.4	0	0.9	26	54
24	25.1	11.7	18.4	0	0.4	0	29	37
25	32.1	9.7	20.9	0	2.9	0	26	56
26	25.6	11.4	18.5	0	05	0	14	32
27	18.4	10.5	14.5	3.5	0	0	26	54
28	26.9	7.8	17.4	0.6	0	0	12	41
29	21.1	11.8	16.5	1.5	0	0	3	39
30	28.2	13.9	21.1	0	3.1	1.2	15	46
Sum				**99.2**	**22.4**	**38.3**		
Avg	**22.1**	**8.7**	**15.4**					
Xtrm	**32.1**	**0.7**					26	61

Appendix Table 9.2 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	22.2	9.7	16.0	2.0	0	0	35	37
02	24.4	6.5	15.5	2.5	0	0		
03	20.2	11.7	16.0	2.0	0	7.1	13	32
04	22.1	8.4	15.3	2.7	0	0.3		
05	21.2	12.6	16.9	1.1	0	2.5		
06	22.7	9.5	16.1	1.9	0	0	10	35
07	21.4	13.4	17.4	0.6	0	17.4	12	41
08	17.1	11.6	14.4	3.6	0	6.3	11	33
09	18.0	9.6	13.8	4.2	0	1.0	30	46
10	17.4	7.7	12.6	5.4	0	0	25	32
11	19.9	5.6	12.8	5.2	0	0	2	37
12	21.3	8.0	14.7	3.3	0	0	14	35
13	22.2	13.8	18.0	0	0	18.6	8	63
14	16.7	10.6	13.7	4.3	0	3.2	30	52
15	18.3	6.9	12.6	5.4	0	0	31	35
16	M	5.5	M	M	M	M		
17	25.3	8.6	17.0	2.0	0	0		
18	29.0	12.0	20.5	0	2.5	0	17	39
19	25.5	14.4	20.0	0	2.0	0	30	46
20	22.6	12.6	17.6	0.4	0	0	31	54
21	25.0	10.3	17.7	0.3	0	0	28	39
22	29.0	10.5	19.8	0	1.8	0		
23	26.5	15.0	20.8	0	2.8	0	1	37
24	28.3	10.6	19.5	0	1.5	0		
25	31.2	13.0	22.1	0	4.1	0	1	37
26	22.6	11.7	17.2	0.8	0	6.0	28	32
27	22.7	11.5	17.1	0.9	0	0	2	39
28	22.1	12.1	17.1	0.9	0	0.5	2	37
29	19.7	9.2	14.5	3.5	0	0	36	33
30	23.1	8.5	15.8	2.2	0	0	25	33
31	19.9	9.3	14.6	3.4	0	0	36	37
Sum				57.6	14.7	62.9		
Avg	22.6	10.3	16.5					
Xtrm	31.2	5.5					8	63

Appendix Table 9.2 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	27.8	5.6	16.7	1.3	0	0	27	32
02	24.9	12.0	18.5	0	0.5	1.5	30	33
03	16.8	8.3	12.6	5.4	0	0	36	32
04	16.8	5.3	11.1	6.9	0	0		
05	21.4	5.8	13.6	4.4	0	0		
06	20.0	10.7	15.4	2.6	0	3	6	37
07	16.4	11.1	13.8	4.2	0	6.8		
08	23.6	9.9	16.8	1.2	0	0		
09	25.9	9.1	17.5	0.5	0	0		
10	29.5	11.1	20.3	0	2.3	0	23	37
11	30.5	15.7	23.1	0	5.1	0	26	52
12	24.4	11.8	18.1	0	0.1	0		
13	20.1	10.7	15.4	2.6	0	0	5	37
14	19.8	9.0	14.4	3.6	0	2.0	9	32
15	20.7	13.8	17.3	0.7	0	7.8	10	32
16	13.8	8.7	11.3	6.7	0	13.4	36	44
17	22.4	7.9	15.2	2.8	0	0		
18	23.5	12.8	18.2	0	0.2	1.8	31	37
19	19.9	11.2	15.6	2.4	0	0	36	52
20	21.7	9.7	15.7	2.3	0	0		
21	23.7	6.6	15.2	2.8	0	0	13	48
22	25.4	12.7	19.1	0	1.1	0	28	46
23	25.5	9.1	17.3	0.7	0	0	13	41
24	22.3	8.7	15.5	2.5	0	0	30	37
25	27.6	6.1	16.9	1.1	0	0	9	32
26	24.9	8.4	16.7	1.3	0	0	7	32
27	16.7	9.5	13.1	4.9	0	0		
28	25.3	5.7	15.5	2.5	0	0.3		
29	25.9	7.4	16.7	1.3	0	0	12	44
30	25.8	7.8	16.8	1.2	0	0		
31	28.9	7.6	18.3	0	03	0	18	41
Sum				**65.9**	**9.6**	**36.6**		
Avg	**23.0**	**9.3**	**16.2**					
Xtrm	**30.5**	**5.3**					**26**	**52**

Appendix Table 9.3. Environment Canada Daily Meteorological Data Report for Saskatoon - 2009

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	14.8	-3.6	5.6	12.4	0	0	30	52
02	15.3	-1.0	7.2	10.8	0	0		
03	22.3	-3.5	9.4	8.6	0	0.5	23	37
04	22.8	6.4	14.6	3.4	0	0	25	44
05	23.7	-0.5	11.6	6.4	0	0.5	2	59
06	14.1	-0.3	6.9	11.1	0	0	1	48
07	8.5	-6.8	0.9	17.1	0	0	8	32
08	2.7	-3.7	-0.5	18.5	0	0	1	33
09	12.2	-7.7	2.3	15.7	0	1.0		
10	18.6	-0.9	8.9	9.1	0	0		
11	22.3	2.9	12.6	5.4	0	0.5	21	37
12	22.3	8.9	15.6	2.4	0	0	36	61
13	9.6	-2.7	3.5	14.5	0	0	36	61
14	2.0	-0.8	06	17.4	0	1.5	10	46
15	11.1	-3.9	3.6	14.4	0	1.0	2	32
16	19.1	-2.9	8.1	9.9	0	0	19	32
17	22.7	5.6	14.2	3.8	0	0	1	63
18	8.7	-0.1	4.3	13.7	0	0	1	54
19	11.6	1.1	6.4	11.6	0	2.0	13	57
20	7.1	-1.2	3.0	15.0	0	0		
21	17.1	-2.8	7.2	10.8	0	0	25	48
22	13.4	1.1	7.3	10.7	0	0.5	33	39
23	21.0	-02	10.4	7.6	0	0		
24	18.8	10.1	14.5	3.5	0	1.5	10	35
25	20.2	4.8	12.5	5.5	0	0	1	35
26	23.7	3.7	13.7	4.3	0	0.5	2	59
27	21.9	7.1	14.5	3.5	0	0	29	61
28	21.0	2.4	11.7	6.3	0	0.5	33	52
29	19.8	1.7	10.8	7.2	0	0	33	59
30	29.9	4.2	17.1	0.9	0	0	2	69
31	21.9	5.9	13.9	4.1	0	0	34	56
Sum				285.6	0	10.0		
Avg	16.8	0.8	8.8					
Xtrm	29.9	-7.7					2	69

Appendix Table 9.3 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
June 01	16.2	1.4	8.8	9.2	0	0	35	56
02	21.2	-2.5	9.4	8.6	0	0		
03	25.3	4.6	15.0	3.0	0	0	32	54
04	15.8	5.5	10.7	7.3	0	2.5	32	63
05	10.9	-2.0	4.5	13.5	0	0		
06	9.9	3.1	6.5	11.5	0	0	5	32
07	13.2	0.9	7.1	10.9	0	1.0	12	39
08	14.4	4.3	9.4	8.6	0	1.5	6	44
09	12.5	1.4	7.0	11.0	0	0.5		
10	16.9	-1.5	7.7	10.3	0	0		
11	24.4	3.8	14.1	3.9	0	0	4	56
12	23.0	4.5	13.8	4.2	0	0.5	34	41
13	28.6	8.6	18.6	0	0.6	0	22	32
14	32.2	14.8	23.5	0	5.5	0	33	44
15	30.7	11.4	21.1	0	3.1	35.5	2	50
16	30.0	12.8	21.4	0	3.4	0.5		
17	29.3	13.4	21.4	0	3.4	0	22	50
18	25.0	9.7	17.4	0.6	0	0	25	50
19	25.1	13.0	19.1	0	1.1	0.5	33	33
20	27.0	15.3	21.2	0	3.2	0.5	18	39
21	20.9	14.2	17.6	0.4	0	35.5	10	52
22	19.9	14.1	17.0	1.0	0	1.5	25	46
23	238	12.9	18.4	0	0.4	0	28	61
24	24.8	7.7	16.3	1.7	0	0	34	39
25	30.4	10.6	20.5	0	2.5	0	27	69
26	25.8	8.2	17.0	1.0	0	0	2	37
27	18.6	9.7	14.2	3.8	0	0	32	46
28	24.9	5.8	15.4	2.6	0	0.5	1	41
29	18.4	10.8	14.6	3.4	0	0		
30	26.7	12.1	19.4	0	1.4	1.0	16	57
Sum				**116.5**	**24.6**	**81.5**		
Avg	**22.2**	**7.6**	**14.9**					
Xtrm	**32.2**	**-2.5**					**27**	**69**

Appendix Table 9.3 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	21.6	9.9	15.8	2.2	0	0.5	2	35
02	24.5	4.1	14.3	3.7	0	0		
03	19.9	9.3	14.6	34	0	0.5		
04	22.2	7.3	14.8	3.2	0	0.5		
05	22.8	11.2	17.0	1.0	0	4.5		
06	23.6	8.6	16.1	1.9	0	0.5	10	35
07	17.2	13.0	15.1	2.9	0	14.0	12	54
08	18.7	10.4	14.6	3.4	0	2.5		
09	17.1	9.3	13.2	4.8	0	3.5	33	61
10	17.2	4.8	11.0	7.0	0	0	33	35
11	14.5	6.4	10.5	7.5	0	4.5	10	46
12	22.3	2.2	12.3	5.7	0	0.5		
13	23.3	12.3	17.8	0.2	0	2.0	15	35
14	16.7	10.0	13.4	4.6	0	17.0		
15	17.6	6.3	12.0	6.0	0	0	35	44
16	21.8	4.4	13.1	4.9	0	0		
17	26.8	9.2	18.0	0	0	0.5		
18	29.6	11.7	20.7	0	2.7	0	2	37
19	25.3	14.9	20.1	0	2.1	0	32	50
20	23.7	11.2	17.5	0.5	0	0.5	32	61
21	25.7	10.2	18.0	0	0	0	31	44
22	27.5	8.2	17.9	0.1	0	0		
23	26.7	12.7	19.7	0	1.7	0	32	37
24	28.3	7.8	18.1	0	0.1	0.5	36	32
25	30.5	14.1	22.3	0	4.3	0	34	35
26	24.7	11.8	18.3	0	0.3	2.5		
27	23.2	9.4	16.3	1.7	0	0	35	48
28	23.8	9.4	16.6	1.4	0	2.0	33	72
29	20.9	8.0	14.5	3.5	0	0	33	37
30	22.6	4.4	13.5	4.5	0	1.5	32	33
31	19.9	9.3	14.6	3.4	0	0.5	36	37
Sum				**77.5**	**11.2**	**58.5**		
Avg	**22.6**	**9.1**	**15.8**					
Xtrm	**30.5**	**2.2**					**33**	**72**

Appendix Table 9.3 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	27.7	6.0	16.9	1.1	0	0.5	3	50
02	24.8	9.8	17.3	0.7	0	5.0	5	35
03	18.1	8.1	13.1	4.9	0	1.0	36	35
04	19.4	6.5	13.0	5.0	0	0		
05	20.9	2.9	11.9	6.1	0	0.5		
06	21.8	12.7	17.3	0.7	0	5.5		
07	20.1	12.3	16.2	1.8	0	2.5	5	33
08	25.1	8.2	16.7	1.3	0	0		
09	25.7	10.3	18.0	0	0	0		
10	29.4	11.3	20.4	0	2.4	0	24	37
11	30.2	11.6	20.9	0	2.9	0.5	33	48
12	25.1	9.2	17.2	0.8	0	1.0	32	33
13	21.4	10.6	16.0	2.0	0	1.5	32	35
14	21.3	7.5	14.4	3.6	0	4.0	5	37
15	15.7	12.0	13.9	4.1	0	51.5	8	46
16	12.3	9.3	10.8	7.2	0	15.0	1	59
17	22.7	7.7	15.2	2.8	0	1.0		59
18	23.5	11.5	17.5	0.5	0	0.5	33	
19	19.4	10.1	14.8	3.2	0	0.5	33	48
20	22.0	8.9	15.5	2.5	0	0	35	56
21	22.4	8.0	15.2	2.8	0	0	15	32
22	24.2	11.4	17.8	0.2	0	0	33	41
23	24.8	7.3	16.1	1.9	0	0	15	50
24	22.2	9.8	16.0	2.0	0	0		46
25	25.2	5.7	15.5	2.5	0	0	11	
26	22.2	9.5	15.9	2.1	0	0	5	33
27	18.3	10.8	14.6	3.4	0	0		35
28	24.8	5.5	15.2	2.8	0	0		
29	24.7	9.3	17.0	1.0	0	0		
30	25.3	9.6	17.5	0.5	0	0		
31	27.9	8.3	18.1	0	0.1	0	21	33
Sum				67.5	5.4	90.5		
Avg	22.9	9.1	16.0					
Xtrm	30.2	2.9					1	5

Appendix Table 9.4. Environment Canada Daily Meteorological Data Report for Regina - 2009

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
May 01	14.4	-2.0	6.2	11.8	0	0	32	63
02	13.9	-4.3	4.8	13.2	0	0	34	57
03	19.4	-5.8	6.8	11.2	0	0.3	18	39
04	21.8	5.8	13.8	4.2	0	0	19	50
05	21.8	0.9	11.4	6.6	0	0	21	48
06	17.0	1.8	9.4	8.6	0	0	30	72
07	9.5	-4.0	2.8	15.2	0	0	2	37
08	4.7	-5.4	-0.4	18.4	0	0	35	33
09	12.1	-5.0	3.6	14.4	0	0		
10	16.7	-1.1	7.8	10.2	0	0	36	35
11	21.2	0.3	10.8	7.2	0	0	19	50
12	22.4	6.0	14.2	3.8	0	0	24	48
13	11.2	-1.5	4.9	13.1	0	12.1	34	70
14	11.2	-4.0	3.6	14.4	0	1.1	13	56
15	8.3	-2.4	3.0	15.0	0	0	1	56
16	18.2	-2.7	7.8	10.2	0	0	24	39
17	24.5	5.2	14.9	3.1	0	0	29	52
18	10.5	3.3	6.9	11.1	0	0	3	50
19	14.2	09	7.6	10.4	0	0.6	13	74
20	11.1	-3.0	4.1	13.9	0	0	29	56
21	16.9	-6.2	5.4	12.6	0	0	27	56
22	11.4	-1.9	4.8	13.2	0	0	33	52
23	20.5	-4.1	8.2	9.8	0	0		
24	24.5	6.1	15.3	2.7	0	15.8	17	61
25	17.7	7.9	12.8	5.2	0	0	34	41
26	22.6	2.8	12.7	5.3	0	0	18	37
27	23.2	115	17.4	0.6	0	0.1	28	65
28	22.0	6.0	14.0	4.0	0	0	31	63
29	23.0	3.4	13.2	4.8	0	0	34	78
30	30.5	1.9	16.2	1.8	0	2.0		
31	23.3	8.4	15.9	2.1	0	0	30	67
Sum				**278.1**	**0**	**32.0**		
Avg	**17.4**	**0.6**	**9.0**					
Xtrm	**30.5**	**-6.2**					**34**	**78**

Appendix Table 9.4 (continued)

Month/Day	**Max Temp °C**	**Min Temp °C**	**Mean Temp °C**	**Heat Deg Days °C**	**Cool Deg Days °C**	**Total Precip mm**	**Dir of Max Gust 10's Deg**	**Spd of Max Gust km/h**
June 01	17.0	0.6	8.8	9.2	0	0	33	61
02	19.1	-2.3	8.4	9.6	0	0	36	33
03	24.4	1.8	13.1	4.9	0	0	30	54
04	19.1	3.7	11.4	6.6	0	0	35	65
05	11.7	-0.8	5.5	12.5	0	0	1	32
06	11.1	3.9	7.5	10.5	0	0	8	39
07	9.8	4.1	7.0	11.0	0	10.2	13	35
08	11.4	5.7	8.6	9.4	0	1.2	6	37
09	13.5	4.2	8.9	9.1	0	2.0	34	32
10	14.8	0	7.4	10.6	0	0		
11	20.5	5.3	12.9	5.1	0	0.8		
12	22.3	7.7	15.0	3.0	0	0	35	35
13	26.3	6.7	16.5	1.5	0	0		
14	30.0	13.2	21.6	0	3.6	0	7	46
15	28.3	8.6	18.5	0	0.5	0	12	37
16	26.2	12.1	19.2	0	1.2	0	12	32
17	28.4	13.3	20.9	0	2.9	2.8		
18	29.6	10.3	20.0	0	2.0	12.0	30	56
19	25.1	11.2	18.2	0	0.2	0	32	50
20	26.8	10.1	18.5	0	0.5	5.6	1	44
21	21.1	14.0	17.6	0.4	0	7.0	17	59
22	23.2	11.6	17.4	0.6	0	0.1	26	50
23	24.3	7.7	16.0	2.0	0	0	28	65
24	26.4	7.9	17.2	0.8	0	0	30	61
25	31.8	7.9	19.9	0	19	0	25	70
26	25.2	8.4	16.8	1.2	0	0		
27	20.7	8.7	14.7	3.3	0	0	32	72
28	25.4	5.3	15.4	2.6	0	0	12	35
29	24.1	12.3	18.2	0	02	0	11	46
30	268	13.3	20.1	0	2.1	0	14	59
Sum				**113.9**	**15.1**	**46.7**		
Avg	**22.1**	**7.2**	**14.7**					
Xtrm	**31.8**	**-2.3**					**32**	**72**

Appendix Table 9.4 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
July 01	23.6	13.2	18.4	0	0	0	14	52
02	23.4	6.8	15.1	2.9	0	0	35	35
03	22.8	9.2	16.0	2.0	0	0	4	33
04	22.6	7.6	15.1	2.9	0	0	35	35
05	20.7	6.4	13.6	4.4	0	1.2		
06	24.7	5.3	15.0	3.0	0	0.4	1	41
07	20.5	12.3	16.4	1.6	0	2.6	12	50
08	16.8	13.1	15.0	3.0	0	16.2	14	35
09	20.4	9.9	15.2	2.8	0	1.6	27	59
10	17.3	5.8	11.6	6.4	0	0	26	41
11	22.5	3.1	12.8	5.2	0	0.8	17	44
12	21.9	7.5	14.7	3.3	0	0	8	37
13	23.1	14.0	18.6	0	0.6	4.2	14	61
14	18.5	10.4	14.5	3.5	0	4.8	32	69
15	18.9	5.6	12.3	5.7	0	0	32	57
16	20.2	2.4	11.3	6.7	0	0		
17	23.6	4.6	14.1	3.9	0	0		
18	27.8	9.8	18.8	0	0.8	0	15	35
19	29.9	11.1	20.5	0	2.5	0		
20	23.3	9.2	16.3	1.7	0	0	30	63
21	25.4	5.1	15.3	2.7	0	0	32	48
22	29.5	7.3	18.4	0	0.4	0	27	32
23	26.8	11.2	19.0	0	1.0	0	34	46
24	26.8	8.4	17.6	0.4	0	0	36	39
25	31.2	9.0	20.1	0	2.1	0	1	32
26	29.1	10.8	20.0	0	2.0	1.2	34	52
27	23.8	9.8	16.8	1.2	0	0	34	56
28	22.9	5.6	14.3	3.7	0	0	36	48
29	19.4	8.6	14.0	4.0	0	0.1	34	50
30	22.8	8.7	15.8	2.2	0	4.0	27	33
31	19.4	10.4	14.9	3.1	0	0	35	56
Sum				**76.3**	**9.8**	**39.1**		
Avg	**23.2**	**8.5**	**15.8**					
Xtrm	**31.2**	**2.4**					**32**	**69**

Appendix Table 9.4 (continued)

Month/Day	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days °C	Cool Deg Days °C	Total Precip mm	Dir of Max Gust 10's Deg	Spd of Max Gust km/h
August 01	27.5	4.3	15.9	2.1	0	0	32	33
02	24.9	11.5	18.2	0	0.2	0	3	50
03	17.7	6.1	11.9	6.1	0	0	34	50
04	17.4	3.7	10.6	7.4	0	0		
05	21.3	4.0	12.7	5.3	0	8.0		
06	23.7	8.8	16.3	1.7	0	3.0	15	46
07	18.9	14.1	16.5	1.5	0	0	36	32
08	21.3	9.6	15.5	2.5	0	0		
09	25.3	6.8	16.1	1.9	0	0		
10	30.0	10.0	20.0	0	0	0	21	33
11	33.2	11.5	22.4	0	2.0	0	26	46
12	27.8	9.0	18.4	0	4.4	0.6	29	33
13	24.2	13.2	18.7	0	0.4	0.8	34	41
14	19.6	13.4	16.5	1.5	0.7	30.0	10	39
15	18.8	13.5	16.2	1.8	0	1.0	11	50
16	14.7	8.3	11.5	6.5	0	6.0	30	52
17	21.9	8.5	15.2	2.8	0	0	34	59
18	22.7	7.2	15.0	3.0	0	2.2	33	48
19	16.6	9.4	13.0	5.0	0	2.2	31	57
20	21.6	10.0	15.8	2.2	0	0	34	48
21	21.9	3.9	12.9	5.1	0	0	16	37
22	29.7	11.7	20.7	0	2.7	0	15	46
23	26.5	8.0	17.3	0.7	0	3.8	14	57
24	21.5	8.0	14.8	3.2	0	0	14	57
25	29.2	5.7	17.5	0.5	0	0	15	33
26	31.0	11.5	21.3	0	3.3	0		
27	20.0	13.8	16.9	1.1	0	0		
28	22.9	9.9	16.4	1.6	0	0		
29	23.7	6.5	15.1	2.9	0	0	5	33
30	24.7	6.4	15.6	2.4	0	0		
31	26.8	8.6	17.7	0.3	0	101	15	44
Sum				69.1	13.7	158.6		
Avg	23.5	8.9	16.2					
Xtrm	33.2	3.7					34	59